Cornell University
Announcements

Graduate School of Medical Sciences
1982-1983

Cornell University
Graduate School of
Medical Sciences

1300 York Avenue
New York, New York 10021
Telephone 212/472-5670

1982-83

1982-83

Calendar

Fall Semester

Registration	Monday, August 30-Tuesday, August 31
Orientation, 9:00 a.m.	Tuesday, August 31
Instruction begins for first trimester and fall semester	Wednesdav, September 1
Labor Day holiday	Monday, September 6
End of first trimester	Wednesday, November 17
Examinations for first trimester	Thursday, November 18-Wednesday, November 24
Thanksgiving recess	Thursday, November 25 and Friday, November 26
Instruction begins for second trimester	Monday, November 29
Winter recess:	
Instruction suspended, 5:00 p.m.	Friday, December 17
Instruction resumed, 9:00 a.m.	Monday, January 3, 1983
Last day for completing all requirements for January degrees	Friday, January 7
Examinations for first semester	Monday, January 17-Friday, January 21
Fall semester ends	Friday, January 21

Spring Semester

Registration	Monday, January 24
Instruction begins for spring semester	Monday, January 24
End of second trimester	Friday, February 18
Washington's Birthday	Monday, February 21
Examinations for second trimester	Tuesday, February 22-Friday, March 4
Instruction begins for third trimester	Monday, March 7
Spring recess:	
Instruction suspended, 5:00 p.m.	Friday, April 9
Instruction resumed, 9:00 a.m	Monday, April 18
Last day for completing requirements for May degree	Friday, May 20
Commencement, 3:00 p.m.	Wednesday, May 25
End of third trimester and spring semester	Friday, May 27
Memorial Day holiday	Monday, May 30
Examinations for third trimester and spring semester	Tuesday, May 31-Friday, June 3

Summer

Registration for summer research	Monday, June 6
Summer research period begins	Monday, June 6
Last day for completing all requirements for August degrees	Friday, August 12
Summer research period ends	Friday, August 26

Note: Courses in the Graduate School of Medical Sciences are either semestral or trimestral. The calendar for this school is based primarily on the academic semester but is coordinated as well with the trimestral calendar of the Medical College. The dates shown in the calendar are subject to change at any time by official action of Cornell University.

In enacting this calendar, the Graduate School of Medical Sciences has scheduled classes on religious holidays. It is the intent of the school that students missing classes due to the observance of religious holidays be given ample opportunity to make up work.

Announcement

Contents

The courses and curricula described in this Announcement, and the teaching personnel listed herein, are as of July 1, 1982 and are subject to change at any time by official action of Cornell University.

The New York Hospital—Cornell Medical Center

Cornell University

Graduate School of Medical Sciences

Purpose and History

The Graduate School of Medical Sciences, a semi-autonomous component of the Graduate School of Cornell University, provides an environment for advanced study and research in specific areas of the basic biomedical sciences. Graduate programs leading to the degree of Doctor of Philosophy are currently offered in the Fields of Biochemistry, Cell and Developmental Biology, Biophysics, Biostatistics, Genetics, Immunology, Microbiology, Neurobiology and Behavior, Pathology, Pharmacology, and Physiology and Biophysics. Certain of these graduate fields also offer programs leading to the degree of Master of Science. The faculty recommends the award of advanced general degrees not only as the result of the fulfillment of certain formal academic requirements, but also as evidence of the development and possession of a critical and creative ability in Science. Proof of this ability is embodied in a dissertation which the candidate presents to the faculty as an original research contribution in the area of study.

Freedom and independence are key qualities of scholarship, and graduate education at Cornell attempts to preserve them for teacher and student. Each graduate student is supervised by his or her own Special Committee, a small group of faculty members selected by the student. Within the broad framework of requirements for residence, examinations, and thesis, and additional regulations of individual fields, the Cornell graduate student and this Special Committee are completely free to plan a program of study. The Graduate School of Medical Sciences sets no overall course, credit-hour, or grade requirements. The Special Committee has extraordinary independence in guiding the student's program, and a student will be recommended for a degree whenever this committee judges the student qualified.

The opportunity for graduate study leading to advanced general degrees in the biomedical sciences was first offered at the Cornell University Medical College in 1912 in cooperation with the Graduate School of Cornell University. In June of 1950, Cornell University, in association with the Sloan-Kettering Institute for Cancer Research, established a new division of the Medical College, the Sloan-Kettering Division, for the purpose of providing additional opportunities for graduate study in the biomedical sciences. The resultant expansion of the graduate faculty and facilities on the New York City campus prompted the organization in January 1952 of the Graduate School of Medical Sciences, which has full responsibility for advanced general degrees granted for study in residence at the New York City campus.

Facilities

The Medical College Division. The buildings of the Medical College extend along York Avenue from Sixty-eighth to Seventieth Streets. They contain the main library, lecture rooms, and study laboratories for the basic science departments, and extensive research facilities for faculty and students.

The Sloan-Kettering Division. The facilities of the Sloan-Kettering Institute for Cancer Research consist of the Howard Laboratory and the Kettering Laboratory on East Sixty-eighth Street in New York City and the Walker Laboratory in Rye, New York. These provide lecture and seminar rooms and well-equipped laboratories for biomedical research.

Organization

Faculty

The Graduate School of Medical Sciences is composed of two relatively separate divisions: the Medical College Division, consisting primarily of the professional staff of the basic science departments of the Cornell University Medical College; and the Sloan-Kettering Division, consisting of the professional staff of the Sloan-Kettering Institute for Cancer Research. Within each of these divisions are fields or units of graduate instruction formed by faculty members with similar research and teaching interests. An individual faculty member may elect to affiliate with the one or two fields or units in which he or she agrees to sponsor graduate students.

General Committee

The General Committee of the Graduate School of Medical Sciences is an administrative board whose membership has responsibility for the academic affairs of the school. The committee considers matters referred to it by members of the faculty and offers recommendations to the faculty on questions involving the interests or policies of the Graduate School of Medical Sciences.

The General Committee is composed of the dean and the associate dean of the Graduate School of Medical Sciences, the associate director of the Sloan-Kettering Division, one elected representative from each of the fields of the Medical College Division and from each of the units of the Sloan-Kettering Division, and two student representatives elected by the graduate student body. The General Committee approves new fields, reviews the admission of students, approves students' major and minor fields, reviews the curriculum of each field, reviews the requirements for degrees, and acts on faculty and student petitions.

The chairperson of the General Committee is the dean, who is the academic administrative officer of the Graduate School of Medical Sciences and is also an associate dean of the Graduate School of Cornell University. The secretary of the General Committee is the associate dean, who is also an assistant dean of the Graduate School of Cornell University.

Admission

Applications

For admission to the Graduate School of Medical Sciences an applicant must (1) have a baccalaureate degree or the equivalent from a college or university of recognized standing, (2) have adequate preparation in the chosen field of study, and (3) show promise of ability to pursue advanced study and research, as judged by his or her previous record.

Inquiries about graduate study should be addressed to the Dean of the Graduate School of Medical Sciences, 1300 York Avenue, New York, New York 10021 or to the Associate Director of the Sloan-Kettering Division, 1275 York Avenue, New York, New York 10021.

Candidates may be admitted in September, February, or July, although places in the graduate program for February and July may not be available because of prior commitments to applicants for September admission. Applicants for February or July admission should correspond directly with the respective field representatives in the Medical College Division or the unit chairperson of the Sloan-Kettering Division regarding the availability of places.

Application material must be completed and returned to the Office of the Dean together with (1) official transcripts of records from all colleges and universities attended, (2) a statement of purpose of graduate study, and (3) two letters of recommendation from individuals in academic positions who know the applicant professionally. In addition, scores from the Graduate Record Examinations are usually required by individual fields to aid in their evaluation. Application for taking the Graduate Record Examinations (GRE's), the Aptitude (Verbal and Quantitative) Test and the Advanced Test, must be made directly to the

Educational Testing Service
Graduate Record Examinations
Box 955
Princeton, NJ 08541

The proper Institution Code Number to use in your GRE application for the Cornell University Graduate School of Medical Sciences (New York City) is R 2119-6.

Applications for September or July admission and all credentials, including official transcripts of records from all colleges and universities attended, must be received by the deadline date of February 1.

Applications and credentials for February admission must be received by November 1.

Application fee. A nonrefundable charge of $25 is made for filing an application for admission.

The completed application and all supporting documents are reviewed by the Field (or Division) Credentials Committee. Applicants who are considered potentially acceptable are usually called for a personal interview. At the time of interview, after discussing his or her interests with the members of the field, the applicant may tentatively select a major sponsor. If accepted by the field, an application is returned to the dean who may refer it to the General Committee for final review and decision. A student is formally notified of acceptance for study in the Graduate School of Medical Sciences by a letter from the dean. An applicant accepted for admission is requested to inform the Graduate School of Medical Sciences of her or his plan to either accept or refuse the offer of admission within one month after the dean's acceptance letter has been received.

It is the policy of Cornell University actively to support equality of educational and employment opportunity. No person shall be denied admission to any educational program or activity or be denied employment on the basis of any legally prohibited discrimination involving, but not limited to, such factors as race, color, creed, religion, national or ethnic origin, sex, age, or handicap. The University is committed to the maintenance of affirmative action programs which will assure the continuation of such equality of opportunity.

Admission policies are also in conformity with the policy of New York State in regard to the

American ideal of equality of opportunity as embodied in the Education Practices Act.

Categories

An applicant is accepted by the Graduate School of Medical Sciences (1) as a degree candidate for the M.S. or Ph.D., or (2) as a provisional candidate.

Provisional candidacy provides opportunity for a prospective degree candidate, whose educational preparation is difficult to evaluate, to begin graduate studies. On the basis of the record of accomplishment in the first half of the academic year, the adviser or temporary Special Committee of a provisional candidate may recommend to the dean that (1) provisional candidacy be changed to degree candidacy, (2) provisional candidacy be continued for the remainder of the academic year, or (3) provisional candidacy be terminated. A maximum of one academic year in the status of provisional candidacy is permitted and credit of a maximum of one residence unit may be allowed on petition, provided there is convincing evidence that performance has been of the same quality as that required of degree candidates.

Special Students

Special students are those students who are not degree candidates in either the Graduate School of Medical Sciences or the Medical College and who are given permission by the respective dean to take courses at either school. Special students must be degree candidates at other institutions and the courses taken at Cornell must be essential to their degree programs and are not offered by the institutions at which they are matriculated as degree candidates as certified by the institutions. Enrollment as a special student is not intended as preparation for admission to degree programs at Cornell or elsewhere.

In the case of the Graduate School of Medical Sciences, special students are accepted only with the approval of the appropriate Field Representative in the Medical College Division or of the appropriate Chairperson in the Sloan-Kettering Division, or in the case of the Medical College with the approval of the departmental head. Special students must demonstrate special qualifications in terms of preparation and ability. They must register with the appropriate office in the Graduate School of Medical Sciences or in the Medical College and must pay all tuition and fees before being permitted to attend lectures or laboratory sessions. Tuition is computed on the basis of the ratio of course hours taken to the total hours of instruction for the academic year (33 40-hour weeks). There is a registration fee of $25.

Degree Requirements

Major and Minor Fields

A candidate for the degree of Master of Science is required to register for study in one major and one minor field. Each field decides whether the Special Committee of a candidate for the Ph.D. degree must have two or three fields represented. Accordingly, a candidate for the degree of Doctor of Philosophy is required to register for study in one major and one or two minor fields. At least one of the minors must be outside the area of the major field.

The Special Committee

The general degree requirements of the Graduate School of Medical Sciences are minimal in order to give maximum flexibility in choosing a desirable program of study. The student's program is determined with the aid and direction of a Special Committee, consisting of at least three faculty members chosen by the student from those fields that best fit his or her areas of interest. Satisfactory progress toward a degree is judged by the committee rather than by arbitrary standards imposed by the Graduate School of Medical Sciences. There are no regulations of the Faculty of the Graduate School of Medical Sciences governing the specific content of instruction, courses, or grades to which the Special Committee must subscribe, except those imposed by the fields. The committee is primarily responsible for the candidate's development as an independent scholar and scientist.

No later than four weeks after enrollment, a candidate must file a statement of the major and minor fields selected for study, after which the student must choose one faculty member to represent each field and to serve on a Special Committee. The faculty member representing the major field usually advises the student concerning the other selections and chairs the committee. At least one member of the committee must represent a field different from the candidate's major field. Members may agree to serve temporarily during the candidate's first year of residence until the candidate has had the opportunity to become acquainted with areas of research in the fields of his or her choice. On completion of this year of residence, a permanent Special Committee will be formed, the membership of which can be changed with agreement of all members of the old and newly formed committees and the approval of the dean. The members of the Special Committee decide on the student's program of study and research, and judge whether progress toward a degree is satisfactory. After consulting the other members, the chairperson of the Special Committee prepares term reports on the candidate for submission to the dean. The members of the committee serve on all the candidate's ex-

amining committees and they approve his or her thesis.

Registration and Course Grades

No student in the Graduate School of Medical Sciences may double-register for an advanced general or professional degree with any other school or college except the Cornell University Medical College.

At the beginning of each term, students are required to register with the Office of the Graduate School of Medical Sciences and to file a registration of courses form indicating all courses they will take. A fee of $10 is charged for late registration.

At the beginning of each course in which the student is enrolling, the student will complete a separate course registration form for the instructor. All courses for which the student registers for credit will be entered in the official record. Grades of graduate students are reported as: Excellent (E), Satisfactory (S), Unsatisfactory (U), Incomplete (I), Absent (Abs.), or Unofficially Withdrawn (W). A grade of Incomplete or Absent cannot be changed later than one term following the one in which the course was taken.

Registration for the summer is required of those graduate students who will be engaged in research.

Residence

The faculty of the Graduate School of Medical Sciences regards study in residence as essential. Each candidate for an advanced general degree is expected to complete the residence requirements with reasonable continuity. A student must register each term from the time of his or her first registration in the Graduate School of Medical Sciences until the student either withdraws or completes a degree (unless a leave of absence has been granted). Full-time study for one-half academic year with satisfactory accomplishment constitutes one residence unit. Two units of residence are the minimal requirement for the master's degree and six units are the minimum for the doctoral degree. However, the time necessary to obtain the degree generally exceeds the minimal requirements. A candidate for the Ph.D. degree must spend two of the last four units of required residence in successive terms on the New York City or the Ithaca campus of Cornell University. No more than seven years may intervene between the time of first registration and the completion of all requirements for the doctoral degree. A student must complete all requirements for the master's degree in four years.

Part-time graduate study, if it is necessitated by off-campus employment noncontributory to the major field of study, is not encouraged. Requests for part-time study must be reviewed by the General Committee. If permission is granted for part-time study, the student must be in residence at least half-time.

The legislation with respect to eligibility of part-time students for residence units is as follows:

Employment	**Residence Units Allowable Per Half Academic Year**		
Total clock hours per week	*Contributory in major field; on campus*	*Noncontributory; on campus*	*Off campus*
0-10 hrs.	1 unit	1 unit	¾ unit
11-20 hrs.	1 unit	¾ unit	¾ unit
21-30 hrs.	¾ unit (teaching) ¾-1 unit (research)*	½ unit	——

* Time spent assisting in research, if it is contributory to the major field of study, shall be credited toward allowance of a full residence unit.

Transfer of Residence Credit

No residence credit will be granted for study outside the Graduate School of Medical Sciences to fulfill the requirements of the M.S. degree. No commitment can be made about granting residence credit toward the Ph.D. requirements for previous study in another graduate school until after the candidate has entered into residence at the Graduate School of Medical Sciences. At that time, the student's Special Committee may recommend acceptance of study outside the Graduate School of Medical Sciences to the General Committee, which will determine the number of residence units to be awarded. No credit can be transferred for study undertaken as an undergraduate or as a special student even in courses designed for graduate students.

A student who has satisfactorily completed two or more academic years of study toward the degree of M.D. at the Cornell University Medical College, or another accredited medical school in the United States with a curriculum equivalent to that of the Cornell University Medical College, may transfer a maximum of two units of residence credit after passing an evaluation examination administered by a committee appointed by the General Committee of the Graduate School of Medical Sciences.

Summer Research

Registration is required for the summer research period whether or not this effort will be credited toward residence unit accumulation. Students registered for summer research pay prorated tuition only if they are obtaining residence credit. However, no degree candidate is eligible for more than two residence units in any period of twelve consecutive months.

Study *In Absentia*

A candidate for the degree of Doctor of Philosophy may petition for permission to earn residence units for study away from Cornell University while regularly registered in the Graduate School of Medical Sciences. A candidate to whom this privilege has been granted may work temporarily under the immediate supervision of an individual designated by his or her Special Committee, but the candidate's program will continue to be directed by the committee. For study *in absentia*, not more than two residence units may be earned toward fulfillment of the minimal residence requirements for the Ph.D. degree. A student given leave for such study must register as a candidate *in absentia* and pay a fee of $200 per semester, and may continue his or her hospitalization insurance by payment of the annual premium directly to the Student Accounting Office of Cornell University Medical College. If students *in absentia* take advantage of local privileges, such as the use of the library, desk space, Student Health Service, hospitalization insurance, and Cornell housing, the fee is $400 per semester.

Leave of Absence

A candidate who finds it necessary to interrupt the continuity of his or her residence must petition the Dean for an official leave of absence. This written petition must specify the term of absence, state the reason for the requested leave of absence, and be approved by the student's Special Committee.

A student who will *not* be in residence but will return to the Graduate School of Medical Sciences to present and defend a thesis at the final examination, having completed all requirements for a degree except for the final examination, must petition for a leave of absence. On return to the Graduate School of Medical Sciences for the final examination, the candidate will register as a Candidate for Degree Only and will pay a fee of $35.

Examinations

Three examinations are required by the Faculty of the Graduate School of Medical Sciences: (1) final examination for the M.S. degree, (2) examination for admission to doctoral candidacy, and (3) final examination for the Ph.D. degree. Examinations are administered by an Examining Committee consisting of a chairperson appointed by the dean, the members of the candidate's Special Committee, and, in the case of the Admission to Candidacy Examination, three additional members selected from the faculty of the Graduate School of Medical Sciences and/or of other institutions. In addition to these examinations, the candidate's major field may require a qualifying examination as part of its evaluation of the candidate after two units of residence have been completed.

For the M.S. degree: the final examination may be oral or both oral and written.

For the Ph.D. degree: the Admission to Candidacy Examination is both oral and written and certifies that the student is eligible to present a thesis to the Faculty of the Graduate School of Medical Sciences. The examination should be taken after course work is largely finished but before significant thesis research has begun. Accordingly, the usual examination time will be at the end of the second year of residence. The examination may not be taken until two units of residence credit have been accumulated and a minimum of two units of residence credit is required after passing this examination before the final examination can be scheduled. The final examination for the Ph.D. degree is an oral defense of the candidate's thesis. It must be passed within four years after completion of the required residence units, or within seven years from the date of first registration, whichever is earlier.

Foreign Language Requirements

Each field of study has its own foreign language requirements. The student's Special Committee may require knowledge of foreign languages beyond the requirements of the fields listed in this *Announcement*.

Arrangements for a foreign language examination will be made on application to the Office of the Dean. As an alternative to this examination, the candidate may demonstrate proficiency by having passed the reading part of the language qualification tests administered by the College Entrance Examination Board.

Theses

A principal requirement for both the M.S. and the Ph.D. degrees is the presentation of a thesis constituting an imaginative contribution to knowledge. Ordinarily, the thesis is written on a research topic in the candidate's major field of study, under the direction of the chairperson of his or her Special Committee. The faculty requires that the Ph.D. thesis be published in abstract and be recorded on microfilm.

Tuition and Fees

Tuition

Tuition for a student regularly matriculated in the Graduate School of Medical Sciences is $7950 for the academic year 1982-83 and is payable in two equal parts, the first of which is due at initial registration. Tuition includes fees for matriculation, hospitalization insurance, graduation, and miscellaneous thesis expenses.

For graduate students who (1) have been in continuous residence at Cornell in the same doctoral program and have passed their Admission to Candidacy Examination and (2) are not taking

courses in the Medical College curriculum, a reduced charge of $1800 per annum ($900 per semester) will be made for tuition and fees for the terms subsequent to the Admission to Candidacy Examination. For those students who are accepted into the Ph.D.-M.D. Program (see p. 36) and will continue to take courses in the medical curriculum, an additional tuition charge, based on the Medical College tuition ($11,200 per annum), will be made for the medical course hours taken.

A student who is to receive partial residence credit (see p. 8) because of employment should apply for proration of tuition on forms obtainable at the Office of the Dean. Proration of tuition does not apply to the special reduced tuition of $900 per semester.

Other Fees

In Absentia A graduate student registered *in absentia* pays a fee of $200 each term. If students *in absentia* take advantage of local privileges, such as the use of the library, desk space, Student Health Service, hospitalization insurance, and Cornell housing, the fee is $400 per semester.

Active-File Fee Doctoral graduate students filing leaves of absence will be required to pay an active-file fee of $200 for each semester, up to a maximum of six semesters ($1,200), during which they are not registered with the Graduate School. This fee will not be subject to finance charges but must be paid before the student can receive an advanced degree. Petition for waiver of this fee will be considered for students who have not completed residence units.

Candidate for Degree Only A graduate student who returns to the University to present a thesis and to take the final examination for an advanced degree, all the work for that degree having been previously completed, must register as a Candidate for Degree Only and pay a fee of $35 unless the student has paid the active-file fee during the semester in which the final examination is taken.

A graduate student who has previously fulfilled all other degree requirements, who has been granted a leave of absence, and who returns to the Graduate School of Medical Sciences to present a thesis and to take the final examination must register as a Candidate for Degree Only and pay a fee of $35.

Any individual who owes money to the University will not be allowed to register or reregister in the University, receive a transcript of his or her record, have his or her academic credits certified, be granted a leave of absence, or have a degree conferred.

The amount, time, and manner of payment of tuition, fees, or other charges may be changed at any time without notice.

Refunds

Part of the amount *personally* paid for tuition will be refunded if the student obtains official certification of leave of absence or withdrawal from the Graduate School of Medical Sciences during the semester. Students who terminate their registration during a regular term in this manner will be charged tuition from the registration day to the effective date of the certificate as follows: first week, 10 percent; second week, 20 percent; third week, 30 percent; fourth week, 40 percent; fifth week, 60 percent; sixth week, 80 percent; seventh week, 100 percent. No charge will be made if the effective date of leave or withdrawal is within the first six days of the term, including registration day.

Financial Assistance

All applicants to the Graduate School are requested to submit a Graduate and Professional School Financial Aid Service (GAPSFAS) form providing an estimate of financial need. The information will be used in two ways: the number of students with documentable need will allow the University to obtain maximum federal funding for loans and work-study purposes, and the specific need of an applicant *may* be used to determine that individual's graduate support. Please obtain the necessary form, available at your college or university financial aid office and from the Educational Testing Service. File the form with the Educational Testing Service, Box 2614, Princeton, New Jersey 08541, and request that the information be sent to Cornell—Code 2267.

Financial assistance is available to qualified applicants. Individual fields or units may offer predoctoral research fellowships, research assistantships, or teaching assistantships. These positions may provide a stipend in addition to tuition. Information about these positions may be obtained directly from the field or unit at the time of application.

Nationwide competitive predoctoral fellowships are available from the National Science Foundation and the National Research Council. Information about these fellowships should be requested directly from the appropriate governmental agency.

New York State residents are eligible for several predoctoral fellowships and for the Tuition Assistance Program, which assists in tuition payments. Application forms may be obtained from the New York Higher Education Services Corporation. Student Financial Aid Section, Tower Building, Empire State Plaza, Albany, New York 12255.

Several loan programs are available to graduate students. Under these programs, repayment of the principal amount of the loan together with the interest on the loan may be deferred until after graduation. Complete information regarding loan programs may be obtained from the

Office of Financial Aid, Room C-118, Medical College Building.

Opportunity for part-time employment is often available in departmental research projects or other activities. Applications should be made directly to individual departments. The Graduate School of Medical Sciences participates in the Work-Study Program of Cornell University.

Scholarships and Awards

Graduate School Scholarships. The Office of the Dean of the Graduate School of Medical Sciences administers tuition scholarships to students in the Medical College Division from funds generously made available by the Dean of the Medical College. The award of these tuition scholarships is made on the recommendations of the Field Representatives in the Medical College Division. Tuition scholarships and fellowships are available to graduate students in the Sloan-Kettering Division through the Office of the Associate Director of the Sloan-Kettering Division.

The Vincent Astor Scholarship Fund. Funds for limited tuition assistance are also derived from the income from a generous gift by the Vincent Astor Foundation to the Graduate School of Medical Sciences and to the Medical College. Allocation of these funds for graduate student tuition assistance is made at the discretion of the Dean of the Graduate School of Medical Sciences on the recommendations of the Field Representatives in the Medical College Division and of the Associate Director of the Sloan-Kettering Division.

The Lois and Max Beren Foundation may award a scholarship to a promising student accepted for admission at Cornell University Medical College in an amount to be determined by consultation between the college and the foundation. The student shall be selected by the college, subject to the approval of the foundation, and may be a candidate for either the Ph.D. or M.D. degree. It is the desire of the foundation to assist a student who possesses a great eagerness to pursue studies but who would find it impossible or impractical to do so without the financial support of the foundation.

The Elizabeth C. Lowry Scholarship Fund was endowed by Dr. Lowry, a member of the class of 1935, in memory of her late husband, Dr. Thomas Lowry, who was also a member of that class. The income is to be used to provide financial assistance to women students in the Medical College. If, in any year, there is no woman student in need of such assistance, the income available may be awarded to a woman candidate for a Ph.D. in the Graduate School of Medical Sciences.

The Frank R. and Blanche A. Mowrer Memorial Fund. Limited financial assistance is available from the income of this fund to one student per year enrolled in the Ph.D.-M.D. or M.D.-Ph.D. program.

Training in Psychiatry Fund. A grateful patient, recognizing the value of psychiatric therapy in helping people achieve a more normal, fruitful life has established this fund to provide financial assistance to students preparing for a career in psychiatry. Students who seriously intend to enter the field of psychiatry and who are judged qualified by the faculty, are eligible for financial aid after the second year of the medical course. Financial assistance may also be given in support of graduate or postgraduate training in the Payne Whitney Psychiatric Clinic.

The Frank Lappin Horsfall Jr. Award is endowed by funds provided in memory of Dr. Horsfall by his many friends and family. It is continued evidence of his concern for students manifest during his directorship of the Sloan-Kettering Division.

The award is available annually to a student of the Sloan-Kettering Division, who in the opinion of the Committee of the Faculty of the Sloan-Kettering Division, has been most distinguished, especially in the Admission to Doctoral Candidacy Examination.

The Julian R. Rachele Prize. The income of a fund established by Dr. Julian R. Rachele, former dean of the Cornell University Graduate School of Medical Sciences, provides a prize to be awarded to a candidate for the Ph.D. degree for an outstanding research paper. Research papers submitted for presentation at an annual colloquium sponsored by the Graduate School of Medical Sciences will be evaluated for this award.

Student Health Services

The Student Health Plan of Cornell University Medical College provides hospitalization and major medical insurance for all graduate students. In addition, the Plan provides for ambulatory care at the Personnel Health Service of The New York Hospital-Cornell Medical Center. Physicians at the Health Service will refer students who require specialized care to clinics of the Hospital and to attending physicians of the staff.

The cost of medical services provided by the Plan are included in the tuition and fee structure announced by the College each academic year. Students will be issued Plan membership cards and will receive courtesy privileges at The New York Hospital Pharmacy.

Entering students are requested to have a physical examination, chest X-ray and laboratory tests performed by their personal physicians prior to matriculation. The hours of the Personnel Health Service and a complete statement of Plan benefits will be provided to each graduate student.

The College recommends that students purchase insurance coverage for eligible dependents who do not have other insurance available to them. Insured dependents are not eligible for care at the Personnel Health Service but they will be referred to appropriate members of the Hospital staff for medical treatment.

A student on leave for study *in absentia* may continue hospitalization insurance by payment of the annual fees directly to the Student Accounting Office, Room C-015, Medical College Building.

A student on a leave of absence for reasons other than study *in absentia* is not eligible to receive student health benefits.

Residence Halls

F. W. Olin Hall, a student residence, is at 445 East Sixty-ninth Street directly across from the Medical College entrance on York Avenue. Olin Hall contains a gymnasium, snack bar, lounge and 174 residence rooms. Each residence room is furnished as a single bedroom-study, but since two rooms share a connecting bath, they may be used as a suite for two students. The rooms are completely furnished. The student housing fee is $1,500 for the 10-month academic year, $1,800 for the calendar year, or for shorter periods $150 per month.

Livingston Farrand Apartments, also located on East Sixty-ninth Street just beyond Olin Hall, have furnished apartments of 1½, 2, 3, and 4 rooms. Cooking facilities are provided in these apartments and housing fees in these buildings range from $185 to $350 per month. Apartments in these facilities are available to married students and upperclasspersons.

Jacob S. Lasdon House, an apartment residence, is located at 420 East Seventieth Street. This building contains studio, one-bedroom, and two-bedroom apartments. Apartments are fully furnished and housing fees range from $330 to $572 per month including utilities. Single, first-year students cannot be accommodated in this building.

The fees listed above may be changed at any time without previous notice.

Cornell University

Fields of Instruction

Instruction at the Medical College Division

Biochemistry

Faculty

J. P. Blass, A. L. Boskey, E. Breslow, A. J. L. Cooper, J. Cornell, T. Duffy, G. F. Fairclough, J. D. Gass, H. Gilder, J. Goldstein, O. W. Griffith, D. Hajjar, R. H. Hashemeyer, B. Horecker, A. Meister, A. Novogrodsky, A. S. Posner, S. G. Powers, J. R. Rachele, R. R. Riggio, A. L. Rubin, B. Saxena, E. T. Schubert, R. L. Soffer, K. H. Stenzel, S. S. Tate, P. P. Trotta, S. Udenfriend, D. Wellner, K. Woods

Field Representative

S. S. Tate, Department of Biochemistry, Room E-106, Medical College, (212) 472-6190

Graduate instruction is offered leading to the Ph.D. degree. Within the framework of degree requirements and in consultation with the student, the course of study is planned to fit the needs of the individual. Although formal course work is required, emphasis is placed on research. Research opportunities exist in various fields of biochemistry including enzymology, structure and function of proteins and nucleic acids, molecular biology, physical biochemistry, and the intermediary metabolism of amino acids, carbohydrates, nucleic acids, and lipids. Entering graduate students usually work for short periods in several of the laboratories of the faculty members of the field before beginning their thesis research. Students are encouraged to choose challenging and fundamental research problems that are on the frontiers of biochemistry.

The laboratories of the faculty members are equipped with virtually all of the instruments and facilities required for modern biochemical research; thus, graduate students are instructed in such methodology as chromatography, countercurrent distribution, radioactive and stable isotope techniques, spectrophotometry, electrophoresis, and analytical ultracentrifugation.

Students who undertake graduate study in biochemistry must have a sufficiently comprehensive background in chemistry to pursue the proposed course of study and must present evidence of knowledge of biology, general experimental physics, and mathematics (including differential and integral calculus). Students may remedy deficiencies in these areas during the first year of graduate study. The Graduate Record Examinations (the Aptitude Test and the Advanced Test in chemistry) are ordinarily required.

The language requirement for the Ph.D. and the M.S. degrees is proficiency in one modern foreign language acceptable to the student's Special Committee. Proficiency in a computer programming language, as demonstrated by executing a meaningful program, may substitute for proficiency in a foreign language.

Students are encouraged to complete applications for fall admission before the preceding February 1.

Special Interests of the Faculty

J. P. Blass: genetic and metabolic aspects of neurochemistry

A. L. Boskey: mechanisms of biological calcifications; role of phospholipids and proteoglycans in bone and tooth formation; structural studies of hard tissue by X-ray crystallography and electron microscopy

E. M. G. Breslow: structure-function relationships in the interactions between posterior pituitary proteins and hormones; protein-protein and metal ion-protein interactions

A. J. L. Cooper: ammonia, amino acid and α-keto acid metabolism in the brain; use of ^{13}N isotopic tracers in brain metabolic studies

J. S. Cornell: biochemistry of reproduction; protein chemistry of the placenta; endocrine influences in gestational diabetes and toxemia of pregnancy; anterior pituitary hormones

T. E. Duffy: neurochemistry; carbohydrate and energy metabolism in altered functional states of brain; ammonia detoxification and hepatic coma; biochemistry of developing brain

G. F. Fairclough: clinical biochemistry; pulmonary surfactant biosynthesis; lipoprotein structure and function

J. D. Gass: mechanism of enzyme action; application of computers to biological problems

H. Gilder: pulmonary lamellar bodies and surfactant, lung lipid synthesis, evaluation of surfactant in etiology of oxygen toxicity,

metabolic response to surgery, experimental shock

J. Goldstein: structure-function of red cell surface antigens; cell surface and differentiation; protein synthesis

O. W. Griffith: design and synthesis of enzyme specific substrates and inhibitors; *in vivo* manipulation of metabolic pathways; enzyme mechanisms; sulfur amino acid metabolism

D. Hajjar: lipid metabolism; study of the pathogenesis of cardiovascular disease induced by viruses and endothelial injury

R. H. Haschemeyer: structure of fibrinogen; subunit interactions in proteins; electron microscopy of macromolecules; lipoprotein and membrane structure; computer simulation and numerical analysis

B. L. Horecker: intermediary metabolism; structure-function relationships in biomolecules

A. Meister: enzymology; amino acid metabolism and its relationships to human disease

A. Novogrodsky: lymphocyte activation and cell-cell interactions; cellular and transplantation immunology

A. S. Posner: crystal chemistry; ultrastructural biochemistry; atomic structure of bone; hard-tissue chemistry

S. G. Powers: regulation of enzyme activity; protein-protein interactions; mechanism of enzyme action

R. R. Riggio: transplantation: biochemistry of immunologic phenomena associated with humoral sensitization of transplantation antigens; and allograft tolerance

A. L. Rubin: transplantation; antoimmune disease, cellular biochemistry

B. Saxena: chemistry, measurement, and mechanism of action of pituitary protein hormones; structure-function and hormone-receptor interaction of gonadotropins

E. T. Schubert: enzyme studies of the developing kidney, clinical biochemistry

R. L. Soffer: angiotensin-converting enzyme; amino-acyl-tRNA-protein transferases; studies of membrane-bound enzymes

K. H. Stenzel: cell proliferation and differentiation

S. S. Tate: plasma membrane enzymes; metabolism and physiology of hypothalamic releasing hormones

P. P. Trotta; molecular basis of the immunodeficiency diseases; biochemistry of colon cancer; structure-function relations in adenosine deaminase

S. Udenfriend: elucidation of the pathways of enkephalin biosynthesis and determination of the structure of proenkephalin

D. Wellner: mechanisms of enzyme action; enzyme kinetics; protein structure

K. R. Woods: physical-chemical understanding of human blood fractions; blood coagulation, structure of antibodies; interferon synthesis and structure

Courses

1. Graduate Biochemistry Offered jointly by the faculties of the Medical College and Sloan-Kettering Divisions. Details are given on p. 34 under Interdivisional Courses.

2. Introduction to Research Experimental biochemistry dealing with the isolation, synthesis, and analysis of substances of biochemical importance (enzymes, coenzymes, various metabolites, and intermediates), and study of their properties by various chemical and physical techniques. The student obtains this varied research experience by spending approximately two months in the laboratory of each of four faculty members of his or her choice. For incoming graduate students majoring in biochemistry. The staff.

3. Selected Topics in Biochemistry Advanced study in selected topics is offered in areas such as (1) nucleic acids and protein synthesis; (2) intermediary metabolism; (3) kinetics and enzyme mechanism; (4) protein chemistry; (5) structure of membranes and the biochemistry of transport; (6) hormones; and (7) microprotein and peptide chemistry. Generally, one or two of these courses is offered yearly in the third trimester. The staff.

4. Advanced Biochemistry The course consists of a series of lecture units (minicourses) covering topics such as size, shape, and structure of macromolecules; molecular biology; information transfer; membrane structure and function; hormones; enzyme structure and function; antimetabolites in chemotherapy; and other subjects of current research interests. These subjects are taught at an advanced level with particular attention to contributions of recent research. It is not essential that students take the lecture units in any particular sequence. Minimal prerequisite: Biochemistry (described above) or its equivalent. Winter and spring trimesters. S. S. Tate, and staff.

5. Physical Methods This course consists of a series of workships including laboratory demonstrations and lectures and/or tutorials in physical techniques for the study of macromolecular and cellular structure. Examples of techniques available for study are: hydrodynamic and equilibrium methods, electron microscopy and other optical methods, resonance methods, and separation techniques such as chromatography, electrophoresis, isoelectric focussing, affinity methods. Time and place must be arranged with the faculty members in charge. Prerequisites: Graduate Biochemistry or its equivalent and Physical Chemistry. First trimester.

Cell and Developmental Biology

Faculty

R. Bachvarova, C. G. Becker, J. M. Bedford, D. Bennett, C. Bianco, A. L. Boskey, D. C. Brooks, P. G. Bullough, D. A. Fischman, F. G. Girgis, J. Goldstein, B. B. Kaplan, C. R. Minick, R. Nachman, M. S. Risley, T. C. Rodman, B. Saxena, E. T. Schubert, J. L. Sirlin, G. W. Siskind, D. Soifer, R. C. Swan, S. S. Wachtel

Field Representative

J. L. Sirlin, Department of Anatomy, Room A-229, Medical College, (212) 472-6418

Graduate study in the Field of Biological Structure and Cell Biology leads to a Ph.D. degree and emphasizes the basic relationships between structure and function of biological systems at all levels of organization. Thus the field is fundamentally concerned with the nature, development, and functional modulation of biological systems, as well as significance of configuration, pattern, and other spatial relations in biological systems. The scope of interest extends from the molecular level to that of the whole organism and embraces normal as well as pathological structure.

Opportunities for research training include the investigation of cellular fine structure using such techniques as light and electron microscopy, isolation and analysis of cellular subfractions by differential ultracentrifugation, cytochemistry, molecular biochemistry, and enzymology.

For graduate study in the field, adequate undergraduate preparation in biology, chemistry (including organic chemistry), physics, and mathematics is recommended. Requirements for admission are flexible in proportion to the promise and accomplishments of the applicant. Applicants are requested to present the results of the Graduate Record Examinations.

Requirements for minor sponsorship in the field will be arranged with individual students, but research experience in the minor sponsor's laboratory is strongly encouraged.

In addition to the courses listed below, appropriate courses for graduate students in the field are Biochemistry, Physiology, and those courses given by the Field of Neurobiology and Behavior.

A reading knowledge of a foreign language is desirable.

The field requires a qualifying examination at the end of the first year of residence. At the discretion of the examining committee, the examination may be written, or oral, or both. The Admission to Candidacy Examination required by the Graduate School of Medical Sciences must be taken before six units of residence credit have been accumulated and before substantial progress has been made in the candidate's thesis research.

Special Interests of the Faculty

R. Bachvarova: molecular developmental biology
C. G. Becker: cardiovascular and renal disease; immunopathology
J. M. Bedford: physiology of mammalian gametes and reproductive tract
D. Bennett: mammalian genetics, with special reference to genetic regulation during early embryonic development
C. Bianco: cell biology of leucocytes; proteins of the complement and of the coagulation system in monocyte function
A. L. Boskey: structural studies of hard tissue by x-ray crystallography and electron microscopy.
D. C. Brooks: spontaneous electrical activity of the central nervous system; brain stem influences upon the visual system during sleep and wakefulness in the cat
P. G. Bullough: diseases and metabolism of bone
D. A. Fischman: cell and developmental biology of skeletal and cardiac muscle
F. G. Girgis: the cranial and facial sutures, their development, structure, and the analysis of sutural position; of particular interest are factors inducing chondrogenesis in the cranial vault
J. Goldstein: role of RNA in protein synthesis, fractionation of nucleic acids; role of macromolecules and protein synthesis in the maturation of red blood cells
B. B. Kaplan: gene activity and its regulation in brain
C. R. Minick: pathogenesis of arteriosclerosis and hypertension; immunopathology; electron microscopy
R. L. Nachman: biology of platelets
M. S. Risley: chromosome structure; interactions during meiosis; cell dissociation; cell culture
T. C. Rodman: analytical cytology of cell nuclei; cytogenetics
B. Saxena: chemistry, measurement, and mechanism of action of pituitary protein hormones
E. T. Schubert: enzyme studies of the developing kidney; investigation of renal dysfunction at enzyme level
J. L. Sirlin: reproductive biology
G. W. Siskind: immunology; ontogeny of immune response; antibody heterogeneity
D. Soifer: structure and function of microtubules
R. C. Swan: fine structure of excitable cells
S. S. Wachtel: immunogenetics

Courses

1. Cell Biology and Microscopic Anatomy Offered by the Staff of the Field of Biological Structure and Cell Biology, Medical College Division, in conjunction with the Department of Anatomy, Medical College. This course follows a cellular and differentiative approach aimed at understanding the structure-function correlates that characterize the different tissues and organs. Selected topics are presented in the lectures and laboratory exercises to indicate a pattern of study and depth of analysis that the student can be expected to apply to the study of cells and tissues. A microscope slide collection, presenting tissues and organs in a variety of physiological and developmental states, as well as correlative electron micrographs are provided for individual study in the laboratory. Students must provide their own compound microscopes through their departments or sponsors. First and second trimesters. Lectures: T Th 10-11, F 9-10. Laboratory: T Th 11-1, The staff.

2. Gross Anatomy Regional anatomy is studied principally through dissection of the human body. Supplementing this technique are prosections by instructors, tutorial group discussions, and radiographic and endoscopic demonstrations. Enrollment is limited and students should consult the staff early in order to determine the availability of places. First and second trimesters. The staff.

Genetics

Faculty

F. H. Allen, V. G. Allfrey, K. Artzt(SKD*), R. Bachvarova, D. Bennett(SKD), J. L. Biedler(SKD), E. A. Boyse(SKD), R. S. K. Chaganti(SKD), B. S. Danes, B. Dupont(SKD), J. L. German, III, L. H. Graf, Jr., Z. Harsanyi, M. Hoffmann(SKD), E. Johnson, R. M. Krug(SKD), R. Kucherlapati(Visiting), G. Litman(SKD), P. W. Melera(SKD), L. J. Old(SKD), J. K. Rankin(SKD), T. C. Rodman, P. Rubenstein, N. Sarkar(SKD), F. W. Shen(SKD), S. Silagi, M. Siniscalco(SKD), J. L. Sirlin, J. Stavnezer(SKD), S. Wachtel

* Sloan-Kettering Division.

Field Representative

Lloyd H. Graf, Department of Obstetrics and Gynecology, Room S-519, Medical College, (212) 472-5728

Academic and research training is available chiefly in the following areas: cytogenetics, developmental genetics, genetics and cell differentiation, human biochemical genetics, human somatic cell genetics, immunogenetics, microbial genetics, and nucleic acid biochemistry.

The faculty includes members of the preclinical and clinical departments of the Medical College and faculty members of the Sloan-Kettering Division. A unique opportunity for integrating the study of genetics with other biological and medical interests is thus provided. Within broad limits, students pursue their own programs according to particular interests.

The usual prerequisites for admission to graduate study for an advanced degree in genetics are undergraduate work in chemistry or biology, and courses in general genetics, general chemistry, organic chemistry, general biology, general physics, and mathematics through calculus. Applicants are required to present Graduate Record Examinations scores in the Aptitude Tests and in the Advanced Test in chemistry or biology.

Courses generally required of genetics majors are those numbered 1 through 3 below, and Graduate Biochemistry Microscopic Anatomy, given by the Field of Biochemistry and by the Field of Biological Structure, respectively. Other courses for students in genetics include those numbered 4 and 5 and Advanced Virology offered by the Field of Microbiology.

Students minoring in genetics may be required to take two semesters of the Genetics Seminar and Advanced Genetics. A limited period of work in the laboratory of the minor sponsor is recommended.

Requirements for foreign language are at the discretion of the student's Special Committee.

An oral qualifying examination is required at the end of the first year of residence and the Admission to Candidacy Examination must be taken at the end of the second year of graduate work.

Special Interests of the Faculty

F. H. Allen: immunogenetics of blood groups
V. G. Allfrey: cell nucleus chemistry, chromosomal proteins; genetic control
K. Artzt: genetics of embryonal tumors
R. Bachvarova: developmental molecular biology
D. Bennett: mammalian developmental genetics; immunogenetics
J. L. Biedler: cytogenetics
E. A. Boyse: mammalian immunogenetics
R. Chaganti: human genetics; cell genetics
B. S. Danes: somatic cell genetics (with particular emphasis on human genetic metabolic errors)
B. Dupont: human immunogenetics
J. L. German: mammalian cell genetics and cytogenetics
L. H. Graf, Jr.: molecular genetics
Z. Harsanyi: biochemical genetics of microorganisms
M. Hoffmann: H-2 immunogenetics

E. Johnson: eukaryotic gene expression and packaging
R. M. Krug: viral and molecular genetics
R. Kucherlapati: gene transfer
G. Litman: immunogenetics
P. W. Melera: molecular eukaryotic genetics
L. J. Old: tumor immunovirology
J. K. Rankin: neuro-oncology
T. C. Rodman: cytogenetics with emphasis on mechanisms of genetic control
P. Rubenstein: immunogenetics; histocompatibility; genetics; immunology; immunohematology
N. Sarkar: viral genetics
F. W. Shen: immunogenetics
S. Silagi: gene action and cellular differentiation in culture
M. Siniscalco: somatic cell genetics
J. Sirlin: molecular biology of brain function
J. Stavnezer: isolation and differentiation of immunoglobulin genes
S. Wachtel: developmental biology of sex determination

Courses

1. Genetics Seminar The topics and sponsors for the Genetics Seminar will be announced at a later time. The seminar is normally scheduled to be given on Mondays from 3-5 p.m. during the first, second and third trimesters.

2. Genetics Journal Club An informal meeting of students and staff at which current literature or research is discussed. Held every two weeks throughout the year. F 12. R. Bachvarova.

3. Advanced Genetics Designed to give the student a sound background in genetic theory; an in-depth consideration of the gene as a unit of heredity. First semester: three hours each week to be arranged. Alternate years. Not offered in 1982-1983.

4. Introduction to Research in Genetics Students are expected during their first year to spend time and perform experiments in the laboratories of three faculty members of the Field of Genetics.

5. Medical Genetics Rounds Students participate in the activities of the Medical Genetics Clinic by assisting in the taking of family histories, construction of pedigrees, and in genetic counseling. Ward rounds are carried out weekly. The staff of the Division of Human Genetics.

6. Karyotyping Practical experience in chromosome analysis in the laboratory. Introduction to tissue culture techniques. Limited to two students. Third trimester: one day a week for seven weeks; hours to be arranged. J. L. German.

Microbiology

Faculty

R. W. Dickerman, T. C. Jones, J. S. Keithly, S. R. Meshnick, W. M. O'Leary, R. B. Roberts, C. A. Santos-Buch, L. B. Senterfit, G. W. Siskind, D. H. Sussdorf, M. E. Weksler, M. E. Wiebe

Field Representative

R. W. Dickerman, Department of Microbiology, Room B-414, Medical College, (212) 472-6550

The Field of Microbiology offers graduate training leading to the Ph.D. degree. Under special circumstances, candidacy towards the M.S. degree will be considered. Candidates may select an area of research from such microbiological topics as general and medical bacteriology, microbial chemistry and physiology, immunology, and virology, and parasitology.

Prospective students should complete at the undergraduate level a minimum of one year (or its equivalent) in general chemistry, organic chemistry, general physics, mathematics (including college algebra), botany or zoology (preferably both), and one semester or its equivalent of analytical or quantitative chemistry. General microbiology or bacteriology and calculus are strongly recommended. Students who have not completed the above requirements may be admitted to graduate study on the condition that deficiencies be corrected soon after admission. Applicants are ordinarily required to present Graduate Record Examinations scores for the Aptitude Tests and for the Advanced Test in chemistry or biology.

Individual programs are determined by the student's Special Committee, composed of faculty members representing the major and minor fields. Students majoring in microbiology select their primary courses from those listed below. The nature and number of other courses that may be taken at this institution or at nearby universities will depend on the students' minor fields, their research activities, their individual interests, and the advice of the Special Committees. All students majoring in microbiology are required to assist in the teaching of courses offered by the field.

Students majoring in other fields who elect to minor in microbiology are ordinarily required to take the course Microbiology and an Introduction to Infectious Disease. In addition, students are required to enroll in an advanced course in microbiology or participate in a research project in the laboratory of their minor sponsors. In general this research is expected to take one to three months to complete, depending upon whether the project is pursued on a full-time or part-time basis.

Ph.D. candidates are required to be proficient in one modern foreign language acceptable to their Special Committees.

Although a qualifying examination is not ordinarily given, a student's Special Committee has the prerogative of requiring it. The Admission to Candidacy Examination is administered by a committee consisting of a chairperson appointed by the dean, the student's Special Committee, and three additional faculty members in the Field of Microbiology. The written portion of this examination tests for basic facts and concepts in the candidate's area of study and for the candidate's problem-solving ability within and across disciplinary boundaries. The oral examination provides an opportunity for the student to correct deficiencies in the written examination, to be examined further on general knowledge, and to discuss and be questioned on his or her planned or current research.

Special Interests of the Faculty

R. W. Dickerman: involvement of birds and mammals in the ecology of viruses pathogenic to man
T. C. Jones: intracellular parasitism; macrophage function; immune responses to protozoa
J. S. Keithly: factors influencing infectivity and virulence of parasitic protozoa; testing antimetabolites against blood protozoa
S. R. Meshnick: adaption of infectious protozoa to intracellular survival; design of antiprotozoal agents
W. M. O'Leary: microbial composition; mechanisms of pathogenesis; antibiotic function; instrumental characterization of bacteria; infectious infertility
R. B. Roberts: interactions between microorganisms and phagocytic cells
C. A. Santos-Buch: parasitic diseases; immunopathology; cardiovascular disease
L. B. Senterfit: antigenic structure of mycoplasma; pathogenesis of respiratory viral and mycoplasmic disease; vaccine development; clinical microbiology
G. W. Siskind: regulation immune response, especially anti-idiotype antibody; control of antibody affinity and heterogeneity; ontology of heterogeneity of antibody affinity; effect of aging on the immune response
D. H. Sussdorf: Immunological factors in carcinogenesis; immunocompetence of the athymic ('nude') mouse; macrophage function
M. E. Weksler: lymphocyte interactions with autologous cells in autoimmune and neoplastic diseases; Immunobiology of aging
M. E. Wiebe: human interferon induction, synthesis and regulation; molecular virology

Courses

Students who want to attend any of the following courses either for credit or as auditors should contact the field representative or the faculty member responsible for each course well in advance of the beginning of each course. In general, as many students as possible are accommodated in lectures; however, participation in laboratory sections is restricted.

1. Microbiology and an Introduction to Infectious Disease Presented in the first and second trimesters. Consists of laboratory experiments, lectures, and group discussions. The laboratory work includes an introduction to the procedures used in studying microorganisms, experiments on various physical and biological manifestations of antigen-antibody reactions, the actions of chemotherapeutic agents, a survey of the microbial flora of the upper respiratory and lower intestinal tracts of healthy humans, and an intensive study of the causal agents of specific infections, including fungi, spirochetes, rickettsiae, and viruses, as well as bacteria. The lectures are directed toward the development of basic concepts, particularly the principles involved in microbial growth, the principles underlying active immunization, and the factors that enter into host-parasite relationships. Emphasis is placed on aspects related to the etiology, pathogenesis, epidemiology, and prevention of infectious disease. Special attention is also given to the immunological principles underlying such noninfectious conditions as hypersensitivity, autoimmunity, and graft rejection. Offered every year. Microbiology staff and invited lecturers.

2. Advanced Diagnostic Microbiology The lecture and laboratory sessions acquaint the student with the procedures used in and techniques of management of a clinical microbiology laboratory. Emphasis is upon developing the student's capability in the isolation and rapid identification of organisms from various types of clinical specimens. Liberal use is made of clinical materials available through the diagnostic laboratories of the New York Hospital. Offered every year in the third trimester. Hours by arrangement. L. B. Senterfit.

3. Microbial Chemistry and Physiology Lectures cover literature and methodology pertinent to physicochemical properties of microorganisms and their environments, the growth and death of microorganisms, chemical composition of cells and subcellular structures, nutritional requirements, microbiological assay and auxotrophic mutants, energy metabolism, degradations and biosyntheses, the physiology of pathogenesis, and important microbial products. Laboratory sessions provide experience with large-scale culture and recovery of cells, synthetic media, microbiological assay, extraction of cellular constituents, respirometry, and studies of substrate utilization employing radioactive metabolites. Minimal prerequisites:

general microbiology, qualitative and quantitative analysis, organic chemistry, and at least one semester (or its equivalent) of biochemistry. Offered every other year in the third trimester. Not offered 1982-1983.

4. Advanced Immunology Offered jointly by the faculties of the Medical College and Sloan-Kettering Divisions. Details are given on p. 34 under Interdivisional Courses. Offering to be announced.

5. Advanced Virology Presents, in lectures and laboratory sessions, modern concepts and techniques of virology. Minimal prerequisites for credit are general microbiology and at least one semester (or its equivalent) of biochemistry. Not offered in 1982-1983.

6. Research on Special Problems For students who want significant experience in specialized procedures, which they could not obtain otherwise, the field offers individualized research on special problems. The nature, complexity, and time required for such research vary according to the needs and desires of each student. Such experience is available in each specialty covered by the factulty of the field and can be arranged by consultation of the student with the appropriate faculty member. Available each year and throughout the year. The staff.

7. Thesis Research in Microbiology Required of all students taking a major in microbiology. Offered yearly and throughout the year. The staff.

8. Microbiology Seminar Reports on surveys of the literature in the field and on current research. Presented by graduate students, faculty, and visiting scientists. Attendance is required of all students majoring or minoring in microbiology throughout their programs of study. Offered yearly and throughout the year. One-hour sessions alternate weeks, hours to be arranged. L. Senterfit.

9. Clinical Microbiology Program—Ithaca and New York Campuses During the senior year of a special undergraduate study program at Ithaca or during the year after receiving a bachelor's degree, the student may concentrate on developing skills in clinical microbiology at the Cornell Medical School-New York Hospital in New York City. Students participate in courses concerned with microbiology, an introduction to infectious diseases, diagnostic microbiology, parasitology, immunology, and virology, in addition to working in the hospital diagnostic laboratory. This clinical microbiology specialization is designed to prepare students for employment in clinical microbiology laboratories. However, it could also be selected by students interested in further education or other careers.

Neurobiology and Behavior

Faculty

I. B. Black, D. C. Brooks, A. J. L. Cooper, T. Duffy, D. Gardner, M. S. Gazzaniga, J. G. Gibbs, Jr., G. E. Gibson, B. Grafstein, W. D. Hagamen, M. Hamburg, K. A. Halmi, T. H. Joh, B. B. Kaplan, J. A. Kessler, D. Levy, K. W. Lieberman, T. H. Meikle, Jr., M. Okamoto, V. M. Pickel, F. Plum, D. J. Reis, W. F. Riker, Jr., J. A. Sechzer, G. P. Smith, P. E. Stokes, W. T. Talman, G. Teitelman

Field Representative

T. H. Joh, Department of Neurology, Kips Bay Building, Medical College, (212) 472-5594

The Field of Neurobiology and Behavior provides training in the study of the nervous system. It includes the disciplines of neuroanatomy, neuroembryology, neurophysiology, neuropharmacology, neurochemistry, neuroendocrinology, and neuropsychology and perception. The program of the field emphasizes a multi-disciplinary approach to the study of the nervous system, based on the belief that future advances in our understanding of the nervous system will be derived from knowledge of the thinking and research techniques employed by more than one discipline. Toward this end, the program of the students entering the field is planned in consultation with several staff members, and the students are expected to spend some period of time working closely with members of the faculty whose interests are related to theirs. In addition, there are regularly scheduled seminars in the field during which various aspects of work in progress are presented and discussed. By these means, the students are afforded the broadest possible view of the field during their total training experience.

The student who chooses Neurobiology and Behavior as a major field will be required to satisfy the requirements of the courses in neuroscience, statistics, and biomathematics, and two of the following: microscopic anatomy, physiology, biochemistry, or pharmacology. The student whose major field is Neurobiology and Behavior must have two minors, at least one of which is outside the field. In addition, participation in the seminar program and advanced course offerings is expected. While there are no language requirements, it is suggested that the student achieve mastery of a modern foreign language or a computer programming language. When neurobiology is chosen as a minor field of study, the student is required to participate in the neuroscience course and the seminar program as well as obtain any additional experience that the minor sponsor may suggest.

Applicants to the Field of Neurobiology and Behavior are expected to have had adequate

undergraduate training in biology, organic chemistry, physics, and mathematics. Graduate Record Examination scores are to be submitted with the application. An interview with the applicant is considered highly desirable.

Courses

1. Neuroscience This is the basic undergraduate medical course and is required of all major and minor candidates in the field. It is a broadly based course taught by members of the field and introduces the student to neuroanatomy, neurophysiology, and pertinent neurology. Third trimester. D. Brooks and B. Grafstein.

2. Advanced Neuroscience A course designed to elaborate upon material presented in the basic medical course. The goal is to provide the student with sufficient expertise to critically evaluate original research contributions in a wide variety of sub-fields in the neurosciences. Required course for all major and minor candidates in the field. Two one-hour lectures each week. Schedule to be arranged.

3. Neurobiology Elective Each year the field offers an elective course that considers various special aspects of neurobiology and behavior. In the past, the courses have examined in depth the synapse, developmental neurobiology, and the impact of the environment on the nervous system. Offered in the third trimester, two hours each week; hours to be arranged, four to twenty students. B. Grafstein and staff.

4. Advanced Neurobiology Seminar An elective seminar series covering selected topics in neuropharmacology, neurochemistry and neurophysiology. Offered in the first and second trimesters, one hour each week. F. Plum and staff.

Special Interests of the Faculty

I. Black: development neurobiology in periphery and brain, including enzyme regulation, transsynaptic controls; genetic influences
D. Brooks: brain stem influence on the electrical activity of the visual system during sleep and wakefulness
A. J. L. Cooper: ammonia, amino acid and α-keto acid metabolism in the brain; use of ^{13}N isotopic tracers in brain metabolic studies
T. Duffy: carbohydrate and energy metabolism in altered functional states of the brain; ammonia detoxification and hepatic coma; effect of anoxia on the developing brain
D. Gardner: neurobiology and biophysics of invertebrate synaptic transmission
M. S. Gazzaniga: neuropsychological approaches to behavior
J. Gibbs: central and peripheral mechanisms of feeding behavior in animals and humans
G. E. Gibson: relationship of carbohydrate metabolism to neurotransmitter synthesis
K. A. Halmi: endocrine investigations; epidemiological-demographic treatment studies of eating disorders
M. Hamburg: regulatory mechanisms for the biosynthesis of catecholamine neurotransmitters
T. H. Joh: neurochemistry and regulatory mechanisms of the enzymes involved in monoamine biosynthesis
B. B. Kaplan: gene activity and its regulation in brain and cultured cells of neuroectodermal origin
J. A. Kessler: biochemistry of peptidergic neurons and physiology of nerve growth factors
D. E. Levy: mechanisms of ischemic brain damage
K. W. Lieberman: neurochemical aspects of mental illness and alcoholism
T. Meikle: animal studies of neural mechanisms basic to learned behavior, particularly visual learning
M. Okamoto: neuropharmacology; sedative-hypnotic drug dependence
V. M. Pickel: immunocytochemistry of monoamine synthesizing enzymes in development and regeneration
F. Plum: cerebral metabolism in disease states; central regulation systems
D. J. Reis: central neural regulation of cardiovascular function; regeneration and degeneration in CNS; neurobiology of central monoamine neurons
W. F. Riker, Jr.: pharmacology and physiology of neuromuscular transmission
J. Sechzer: visual learning and memory in adult and neonatal split-brain animals; learning and memory in split-brain animals
G. Smith: feeding behavior, emotional behavior, and learning in rats and monkeys, utilizing concepts of neuroendocrinology
P. Stokes: endocrinology and psychobiology
W. T. Talman: central control of respiration; neurogenic hypertension; central neurotransmitters
G. Teitelman: developmental neurobiology

Pathology

Faculty

D. R. Alonso, C. G. Becker, P. G. Bullough, F. Daniels, Jr., J. W. Dougherty, J. T. Ellis, A. Kellner, R. C. Mellors, C. R. Minick, G. E. Murphy, C. K. Petito, A. M. Prince, C. A. Santos-Buch, L. B. Senterfit, M. Susin, M. E. Weksler

Field Representative

C. G. Becker, Department of Pathology, Room C-444, Medical College, (212) 472-5983

Pathology is the study of the causes and mechanisms of disease processes. The purpose of a

graduate program in pathology is to provide individuals with a baccalaureate or medical degree with basic knowledge of disease processes through study of the disciplines of anatomic and clinical pathology and by learning modern techniques of biological investigation. It is hoped that a student completing this program will have both the information and technical skills to make significant inquiries into the nature of disease processes and to bridge the gap between classical, descriptive pathology and such disciplines as biochemistry and molecular biology.

The graduate program in pathology includes the observation of diseases in their varicus forms at autopsy and in clinical laboratories and study and research in the areas of immunology and immunopathology, oncology, virology, cellular biology, and electron microscopy. It may also include study in advanced mathematics, physiology, biophysics, pharmacology, anatomy, cytochemistry and histochemistry, advanced biochemistry, genetics and microbiology.

New students are expected to have completed mathematics through integral calculus, chemistry through organic chemistry (although physical chemistry is recommended), basic physics and at least general biology. A reading knowledge of at least one foreign language is suggested but not required. For those students entering the program with baccalaureate degrees only, the Graduate Record Examinations, including the Aptitude Tests and the Advanced Test in biology or chemistry, are required.

Graduate students in pathology are required, as a beginning part of their program, to take the course in general and systemic pathology offered to second-year medical students. They must minor in at least one and not more than two other biomedical fields. Courses in biomathematics, biochemistry, genetics, and microbiology are also required. Additional courses not available at the Graduate School of Medical Sciences can be taken at neighboring institutions with approval of the Field of Pathology and the candidate's Special Committee.

Special Interests of the Faculty

D. R. Alonso: cardiovascular pathology
C. G. Becker: cardiovascular and renal diseases; immunopathology; host-parasite relationships
P. G. Bullough: diseases and metabolism of bone
F. Daniels, Jr.: diseases of the skin
J. W. Dougherty: diseases of the skin
J. T. Ellis: electron microscopy; kidney disease; muscle diseases
A. Kellner: immunohematology; lipid metabolism; pathogenesis of arteriosclerosis
R. C. Mellors: studies in immunopathology relating to the role of viruses in autoimmune disease and leukemogenesis
C. R. Minick: pathogenesis of arteriosclerosis and hypertension; lipid metabolism; immunopathology; electron microscopy
G. E. Murphy: cardiovascular diseases; host-parasite relationships
C. K. Petito: neuropathology; ultrastructure and histochemistry of diseases of central nervous system
A. M. Prince: virology; pathogenesis of liver diseases
C. A. Santos-Buch: cellular biology; immunopathology; cardiovascular disease; electron microscopy
L. B. Senterfit: antigenic structure of mycoplasma; pathogenesis of respiratory viral and mycoplasmic disease; vaccine development; clinical microbiology
M. Susin: pathology of renal disease; electron microscopy
M. E. Weksler: lymphocyte interactions with autologous cells in autoimmune and neoplastic diseases; immunology in aging

Courses

1. General and Systemic Pathology Lectures, practical classes, and seminars. First trimester: M W F 9-1. Second trimester: M W 10-1, Th 9-1. The staff.

2. Correlative Pathology Gross and microscopic material is correlated and related to the disease processes. The staff.

3. Forensic Pathology Courses are offered by special arrangement with the chief medical examiner of New York City.

4. Seminars in Pathology Discussions outlining the scope of modern pathology are given weekly. These include reports on original research by members of the staff and by visiting lecturers. Hours to be arranged. The staff.

5. Experimental Pathology Independent research projects in various areas of pathology are offered. The staff.

Related courses The following courses are offered by various members of the field in collaboration with faculty members of related fields. The terms and hours are by arrangement.

Immunopathology
Cardiovascular Pathology
Autopsy Pathology
Orthopedic Pathology
Renal Pathology
Gastrointestinal Pathology
Neuropathology
Surgical Pathology
Cytopathology
Tumor Pathology
Clinical Biochemistry

Hematology and Immunochematology
Clinical Microbiology

Pharmacology

Faculty

T. Baker, J. J. Burns, W. W. Y. Chan, D. E. Drayer, R. W. Houde, C. E. Inturrisi, B. Jones, R. F. Kaiko, H. Kutt, R. Levi, M. Okamoto, G. W. Pasternak, M. M. Reidenberg, A. Rifkind, W. F. Riker, Jr., H. H. Szeto

Field Representative

M. Okamoto, Department of Pharmacology, Room E-411, Medical College, (212) 472-5975

The graduate program emphasizes sound basic training in general pharmacology. Then, by means of individual instruction, the candidate receives exposure to several specialized aspects of pharmacology. The latter part of the graduate curriculum is devoted to research in an area of the candidate's choice.

An adequate preliminary training in organic chemistry, physical chemistry, biochemistry, and physiology is prerequisite to graduate work in pharmacology. Training in statistics is strongly recommended.

Special Interests of the Faculty

T. Baker: neurotoxicology; neuromuscular transmission
J. J. Burns: biochemical pharmacology; drug metabolism
W. W. Y. Chan: renal pharmacology; endocrine pharmacology, polypeptide pharmacology
D. E. Drayer: clinical pharmacology; drug metabolism
R. W. Houde: clinical pharmacology of the analgesic drugs; development of methods of evaluating the effects of drugs on subjective response
C .E. Inturrisi: biochemical pharmacology; metabolism of narcotic response
B. Jones: clinical pharmacology, chemotherapy of neoplastic diseases
R. F. Kaiko: clinical pharmacology of analgesic drugs
H. Kutt: clinical pharmacology, neuropharmacology; drug metabolism
R. Levi: cardiovascular pharmacology; immunopharmacology
M. Okamoto: neuropharmacology; sedative-hypnotic drug dependence
G. W. Pasternak: molecular pharmacology, narcotic drug receptors
M. M. Reidenberg: clinical pharmacology; drug metabolism
A. Rifkind: clinical pharmacology; endocrine pharmacology
W. F. Riker, Jr.: general pharmacology; neuropharmacology; neuromuscular transmission
H. H. Szeto: fetal pharmacology, drug metabolism

Courses

1. General Pharmacology The basic pharmacology course is offered to second-year medical students and to qualified graduate students. It consists of lectures, laboratory work, demonstrations, and seminars given during the first and second trimesters. The purpose of these exercises is to teach the principles of pharmacology. Detailed consideration is given to the parameters of drug action to provide the student with the fundamental concepts essential for the evaluation of any drug. Consequently, the scientific basis of pharmacology is emphasized. Prototype drugs, esentially considered systemically, serve to illustrate several mechanisms and parameters of drug action. Therapeutic applications are considered only insofar as they illustrate principles of pharmacology or drug hazards. Prerequisites: biochemistry and physiology. The staff.

2. Advanced Courses in Pharmacology

a. Molecular Pharmacology Fundamental principles governing the effects of chemicals on living systems are examined from the viewpoint of drug-receptor interactions. Several concepts are introduced including drug selectivity, specificity dose-response, and receptor theory. Examples of receptor isolation and receptor-drug interactions are discussed in detail. Prerequisites: an adequate background in biology, organic and physical chemistry, and biochemistry is required. The staff and invited lecturers. Offered every other year.

b. Immunopharmacology The course focuses on the fundamentals of immunologic cell reactions and explores the mechanism of therapeutic immunologic regulation. Topics include: inflammatory and allergic processes; mechanism of cell activation; mediated release and action; cyclicnycleotides and prostaglandins; lymphokines, interferons and thymic hormones; immunotoxicology; immunologic assays and use of biologics and drugs for immunotherapy. A background in immunology would be helpful but not required. The course is offered by the joint efforts of the faculties of the Medical College and the Sloan-Kettering Divisions, and is offered every other year.

3. Research in Pharmacology Research opportunities may be arranged throughout the year for graduate students who are not majoring in pharmacology but who want some investigative experience in the discipline. Special opportunities are offered for work on the nervous and cardiovascular systems and in biochemical and clinical aspects of pharmacology. The staff.

4. Seminars The Field of Pharmacology offers seminars in areas of interest to the faculty and graduate students of the field. Seminars in clinical pharmacology and teaching rounds are held regularly throughout the year. The content, format and schedule of these seminars are determined each year on the basis of the number and the backgrounds of the interested students. The staff.

Physiology and Biophysics

Faculty

O. S. Andersen, W. A. Briscoe, W. W. Y. Chan, C. Fell, G. Frindt, D. Gardner, B. Grafstein, E. Heinz, L. E. Hinckle, Jr., N. B. Javitt, C. Lee, R. Levi, M. Lipkin, T. M. Maack, L. Palmer, T. G. Pickering, E. M. Rabellino, H. J. Sackin, A. M. Weinstein, E. E. Windhager

Field Representative

T. M. Maack, Department of Physiology and Biophysics, Room D-407, Medical College, (212) 472-5281

Opportunities are offered toward the Ph.D. degree in several areas of physiology and biophysics. Ample space is available, and laboratories are well-equipped to provide predoctoral training in a medical environment. Interested individuals are urged to contact the field representative before preparing a formal application. Letters of inquiry should include a discussion of educational background and indicate possible areas of emphasis in graduate study. There has been a tendency to encourage applications from individuals who have a probable interest in one or more of the areas of physiology represented within the field.

Formal applications should include full college transcripts and at least two letters of recommendation. Graduate Record Examination scores are mandatory, since performance in these examinations is an important factor in the selection of applicants. Introductory courses in biology, inorganic and organic chemistry, physics, and mathematics through the level of differential and integral calculus are required. Additional course work in these disciplines at the undergraduate level is encouraged. Applicants with otherwise exemplary records who lack certain course requirements will be considered for acceptance provided that they remedy their deficiencies while in training.

The course of study emphasizes the importance of teaching and research in the preparation and development of individuals for careers in physiology. This goal is achieved by a combination of didactic courses, seminars, and closely supervised research leading toward the preparation of a satisfactory thesis.

A special program of study will be developed for each student in consultation with his or her Special Committee. In addition to the general requirements set by the Graduate School for all fields, all candidates for the doctoral degree in physiology will be expected to meet the following specific requirements:

1. Evidence of a satisfactory background in neurosciences. Ordinarily, the course in neuroscience described under the Field of Neurobiology and Behavior, or an equivalent course, will be taken concurrently with the course in physiology and biophysics.
2. Satisfactory completion of the course in physiology and biophysics, or an equivalent course.
3. For majors and minors in the field, a minimum of two elective courses in the field ordinarily will be required, in addition to the course in physiology and biophysics.
4. Proficiency in reading scientific literature in one modern foreign language.
5. Satisfactory completion of an individualized laboratory experience in an area of research different from that chosen for the doctoral dissertation.

Special Interests of the Faculty

O. S. Andersen: properties of cell membranes, artificial lipid membranes
W. A. Briscoe: blood gas transfer in health and disease
W. W. Y. Chan: pharmacology of neurohypophysial hormones and related polypeptides
C. Fell: cardiovascular function, particularly blood flow distribution, blood volume, and blood volume distribution
G. Frindt: renal electrolyte metabolism; isolated perfused tubules
D. Gardner: neurophysiology
B. Grafstein: nerve regeneration and transport of materials in nerve axons
E. Heinz: membrane transport; active transport
L. E. Hinckle, Jr.: epidemiology and pathophysiology of cardiac arrythmias and the relationship to sudden death
N. B. Javitt: gastrointestinal and hepatic physiology and pathophysiology
C. Lee: cardiac electrolyte physiology
R. Levi: heart electrophysiology; heart hypersensitivity reactions; histamine in cardiac function
M. Lipkin: proliferation and differentiation of normal and diseased gastrointestinal cells
T. M. Maack: protein transport and metabolism by the kidney
L. Palmer: Mechanisms of hormonal action in epithelia
T. G. Pickering: cardiovascular physiology and pathophysiology
E. M. Rabellino: expression of membrane receptors and antigens in differentiating blood cells
H. J. Sackin: renal and epithelial electrophysiology
A. M. Weinstein: mathematical modeling of epithelial transport.
E. Windhager: renal electrolyte metabolism

Courses

Students who plan to register for the course Physiology and Biophysics must consult the field representative before the start of the second trimester. Students who want to take any of the third-trimester courses (numbered 2-8) are advised to consult the field representative no later than the seventh week of the second trimester in order to assure a place in the course.

1. Physiology and Biophysics Lectures and conferences in body fluids, bioelectric phenomena, circulation, respiration, and gastrointestinal function. Second trimester, four hours each week. The staff.

Lectures and conferences on kidney function, acid-base regulation, endocrinology, and metabolism; and a weekly laboratory on selected aspects of physiology. Third trimester, eleven hours each week. The staff.

2. Respiratory and Renal Mechanisms of Regulation of Acid-Base Balance Each session consists of an informal lecture and a succeeding seminar discussion based on assigned reading in the area of the lecture. Third trimester: three hours each week. Five to fifteen students.

3. Selected Topics in Endocrinology Important scientific papers dealing with certain aspects of endocrinology are distributed to the participants one week in advance of discussion. Each paper is considered in detail in a seminar directed by an investigator in the area under discussion. One or two preliminary orientation sessions are given by Professor Greif before distribution of the first scientific paper, and, if feasible, one or two laboratory days are planned. Third trimester: three hours each week. Six to twelve students. Staff.

4. Selected Topics in Gastrointestinal and Hepatic Physiology and Pathophysiology Topics include bilirubin metabolism and excretion, cholesterol metabolism, bile salt excretion, bile formation, esophageal motility, gastric function, intestinal cell turnover, absorption of fat, absorption of carbohydrate, the malabsorption syndrome. Third trimester: two hours each week. Six to twelve students. N. B. Javitt.

5. Selected Topics in Respiratory Physiology Topics covered include: (1) physiological anatomy of the lung; (2) logical formulation and solution of clinical problems; (3) ventilation, alveolar air diagram, nitrogen washout; (4) relevant lung function tests; (5) lung volumes,

Memorial Sloan-Kettering Cancer Center

effect of posture and disease; (6) diffusion, Fick equation, Bohr integration; (7) acid-base considerations in blood; (8) mechanical properties of lung; (9) ventilation-perfusion ratio and Bohr integral isopleths; (10) ecology, sealed spaces, altitude, diving; (11) lung function in the first week of life. Students who want to take this course must consult Professor Briscoe no later than the seventh week of the second trimester. Third trimester: two hours each week. Maximum of twelve students. W. A. Briscoe.

6. Selected Topics in Kidney and Electrolyte Physiology and Pathophysiology Lectures, seminars, and demonstrations. Topics include: (1) GFR, clearance concept, reabsorption and secretion of electrolytes; (2) concentrating mechanism; (3) electrophysiology of the nephron; (4) pathyphysiology of potassium; (5) renal blood flow and its intrarenal distribution; (6) renal physiology in the newborn; (7) control of body fluid volume and tonicity; (8) pathology of renal failure; urinary sediment; pathophysiology of renal failure; (9) radiology of the kidneys; (10) dialysis; (11) transplantation. Third trimester: two hours each week. Maximum of twelve students. E. Windhager and staff.

7. Special Topics in Cardiovascular Physiology Original research papers will be made available in advance of each session, and these and the general problems associated with each topic will serve as the basis for the discussion. Insofar as possible, experimental approaches to each problem will be demonstrated. To some extent, choice of topics can be determined by the interests of the group. Probable topics include: (1) regulation of peripheral blood flow; (2) integrated cardiovascular responses to hypoxia; (3) pulsatile flow in arteries; (4) measures of myocardial performance; (5) blood volume, hemorrhage, and hemorrhagic shock; (6) cardiac catherization in man, congenital heart disease, valvular heart disease. Third trimester: three hours each week. Six to twelve students. C. Fell.

8. Neurobiology Elective Described under courses offered by the Field of Neurobiology and Behavior.

Instruction at the Sloan-Kettering Division

1. Graduate Seminar This weekly graduate seminar is offered each year. During the first trimester, second-year students will present brief reports on their research experiences in the laboratory rotations. First year students may report on laboratory rotations, review a selected area of research or critically review a research paper. The discussion is carried out principally by graduate students under the guidance of their major (temporary or permanent) sponsors. From time to time outstanding authorities are invited as guest speakers. In addition, students in their third and later years of graduate study, address the seminars on the progress being made in their thesis work.

2. Laboratory Rotations Throughout the year students should spend time in research laboratories. Arrangements for laboratory rotation should be made with the major sponsor.

3. Minor Projects Two minor projects are required of all students. The major sponsor assumes the responsibility for monitoring the time spent on the project. Minors should be completed before the Admission to Candidacy Examination.

4. Laboratory Safety and Biohazards Course All students are required to take by their second year the course of six basic lectures sponsored by the Sloan-Kettering Institute Institutional Biosafety Committee. The series covers general laboratory safety, the use of radioisotopes, carcinogens, primary and secondary barrier systems, contamination control, and hazards associated with research animals, and is supplemented by lectures on special topics given throughout the year.

Biochemistry

Faculty

N. W. Alcock, L. H. Augenlicht, I. Balazs, M. E. Balis, F. C. Bancroft, R. S. Bockman, E. Borenfreund, L. F. Cavalieri, C. Cunningham-Rundles, Z. Darzynkiewicz, A. M. Dnistrian, D. B. Donner, M. Fleisher, J. J. Fox, A. Giner-Sorolla, S. Green, U. Hämmerling, P. J. Higgins, L. Kopelovich, K. O. Lloyd, P. W. Melera, M. J. Modak, A. C. Moore, J. S. Nisselbaum, B. A. Otter, J. C. Parham, J. Roberts, B. H. Rosenberg, A. S. Schneider, M. K. Schwartz, G. C. Sen, M. R. Sherman, M. Sonenberg, G. Stöhrer, L. C. Yip

Unit Chairperson

A. S. Schneider, Sloan-Kettering Division, Howard Laboratory, Room 906, (212) 794-7879

Opportunities are available for advanced study and scholarly research in several areas of cell regulatory biochemistry including mechanisms of hormone action and secretion, neurotransmitters, biomembranes, molecular biology and gene expression, carcinogenesis, development of antineoplastic agents, immunochemistry and enzyme regulation.

A good background in chemistry and biology is required of students majoring in biochemistry. Graduate Record Examination scores are required in both the Aptitude Test (verbal and quantitative) and the Advanced Test in chemistry or biology. Course work in the first year is decided upon by graduate students and their

advisors. In addition to the major in biochemistry, two minor subjects are required.

Students may be required to take an oral qualifying examination. A written examination may be required at the discretion of the student's Special Committee. The Admission to Candidacy Examination is both written and oral.

Special Interests of the Faculty

N. W. Alcock: trace metals; parenteral nutrition
L. H. Augenlicht: transcriptional control, eukaryotes
I. Balazs: RNA characterization; transcription and translation in man-mouse cell hybrids
M. E. Balis: enzyme regulation; purine metabolism
F. C. Bancroft: regulation of gene expression in eukaryotes
R. S. Bockman: parathyroid action, hypercalcemia and carcinogenesis
E. Borenfreund: biochemical genetics; chemical carcinogenesis
L. F. Cavalieri: reverse transcriptase; macromolecules
C. Cunningham-Rundles: molecular aspects of immunity; HLA composition; B-cell receptors
Z. Darzynkiewicz: differentiation and carcinogenesis
A. M. Dnistrian: membrane composition and carcinogenesis
D. B. Donner: hormone action; cell surface regulation
M. Fleisher: tumor-associated antigens; clinical chemical automation
J. J. Fox: development of antitumor and antiviral chemicals
A. Giner-Sorolla: synthesis of antitumor and antiviral chemicals; carcinogenesis
S. Green: isolation of tumor necrotizing factor, macrophage enzymes
U. Hämmerling: differentiation of lymphocytes; immunochemistry of T- and B-cells
P. J. Higgins: comparative biochemistry of embryonic and neoplastic development
L. Kopelovich: chromosomal proteins, nucleic acids, and neoplastic transformation
K. O. Lloyd: immunochemistry; melanoma and ovarian antigens
P. W. Melera: growth and differentiation; biochemistry of RNA
M. J. Modak: DNA polymerase; reverse transcriptase; oncogenic viruses
A. C. Moore: regulation of membrane structure and function
J. S. Nisselbaum: mechanism of enzyme activity; isozymes
B. A. Otter: synthesis of antitumor compounds
J. C. Parham: chemical carcinogenesis; photochemistry; synthesis of antitumor drugs
J. Roberts: enzyme therapy and nutritional deprivation of neoplasms
B. H. Rosenberg: mechanism and control of DNA synthesis
A. S. Schneider: cell surface receptor regulation of hormone and neurotransmitter release
M. K. Schwartz: antigens, hormones, and enzymes in cancer detection; automated clinical biochemistry
G. C. Sen: regulation of gene expression in eukaryotic cells
M. R. Sherman: mechanism of steroid hormone action
M. Sonenberg: mechanism of peptide hormone action; ligand control of membrane structure and function
G. Stöhrer: carcinogenesis and cell differentiation
L. C. Yip: enzymes in purine metabolism, aging, carcinogenesis

Courses

1. Graduate Biochemistry The course is described on p. 34 under Interdivisional Courses.

2. Advanced: Biochemistry I: Hormone and Neurotransmitter Regulatory Mechanisms This course presents the fundamentals of hormone- and neurotransmitter-dependent cell regulatory mechanisms. Topics include: peptide hormone and neurotransmitter action at cell surface receptors; mechanisms of steroid hormone action; mechanisms of secretion of hormones and neurotransmitters. Second trimester. R. S. Bockman, M. R. Sherman and staff.

3. Advanced Biochemistry II: Molecular Biology The course presents the fundamentals of eukaryote gene structure, expression and regulation. Topics discussed include: DNA sequence organization, chromatin structure, viral and cellular RNA transcription, translation and its regulation, control of gene expression in model systems and molecular aspects of carcinogenesis. Third trimester. G. Sen and staff.

Biophysics

Faculty

L. L. Anderson, J. R. Bading, R. E. Bigler, J. Fried, A. S. Gelbard, M. Graham, J. H. Kim, K. L. Kwok, J. S. Laughlin, R. Mohan, W. G. Myers, B. Schmall, P. P. Sordillo, H. Weiss, L. Zeitz

Unit Chairperson

J. S. Laughlin, Sloan-Kettering Division, Schwartz Hall, Room SM-11, (212) 794-7413

Graduate work is offered leading to the Ph.D. degree in biophysics and the M.S. degree in radiation physics. A candidate for the Ph.D. must have a B.A. or B.S. degree with a major in

physics, or with a major in biology, chemistry, or mathematics and a minor in physics. A candidate for the M.S. must have a B.A. or B.S. in physics from a recognized university.

Graduate Record Examination scores in both the Aptitude Test (verbal and quantitative) and the Advanced Test in physics, mathematics, chemistry, or biology are required.

Undergraduate prerequisites for the Ph.D. candidate include courses in general physics, electricity and magnetism, mechanics, mathematics (through calculus), and thermodynamics, and acceptable laboratory experience in these subjects. Any of those requirements not completed at the undergraduate level must be completed during graduate study. Graduate course work required for the Ph.D. is flexible, depending upon the student's background and basic interests, but ordinarily would include advanced courses in areas of physics, biology, biochemistry, and mathematics and courses in the student's minor subjects. In addition, a month spent full time on a laboratory project is required in each of the two minor disciplines.

Students may be required to pass a qualifying examination covering various basic aspects of their major and minor subjects and must pass the Admission to Candidacy Examination. The thesis required for the Ph.D. in biophysics should demonstrate the ability of the student to make a thorough and original investigation in an important area of biophysics. There is no mandatory foreign language requirement.

Some of the research projects in biophysics that are pertinent to the Ph.D. program include: methods of production of radionuclides using a biomedical cyclotron, synthesis of labeled compounds, and their use for *in vivo* metabolic studies; the mechanism of radiation action on bacteria and small animals, including metabolism studies with human and other tumors influenced by radiation under different environmental conditions; fundamental radiobiological studies of mammalian cells in tissue culture and study of the early radiation-induced processes in cells using high-intensity pulsed irradiation techniques; effects of chemotherapeutic agents on cell survival and progression through the cell cycle; application to the treatment of human leukemia; the measurement of radiation by calorimetric, chemical, and solid-state techniques; the measurement of bone mineral content in the human.

A candidate for the M.S. must have a B.A. or B.S. in physics from a recognized university and have completed undergraduate courses in general physics, mechanics, electronics, electricity and magnetism, modern physics, and mathematics through differential equations. The candidate is expected to satisfactorily pass courses selected from some of the following subjects: physics, biophysics, biology, radiobiology, biochemistry, and biomathematics and must minor in one of those subjects other than physics. The thesis subject must be in the field of radiation physics and must represent a comprehensive study demonstrating a thorough knowledge of the chosen subject. A final oral examination will be given, primarily on the subject of the thesis, and may be preceded by a written examination covering the fundamental principles of the course work. There is no mandatory foreign language requirement.

The course of study leading to the M.S. degree in radiation physics trains physicists in the various aspects of production, measurement, and application of radiation to various medical and biological problems. These problems particularly involve the use of radiation in the diagnosis and treatment of cancer. A variety of radiation sources is available, capable of generating photons and electrons with energies ranging from 5 Kev to 25 Mev and with electron dose-rates up to 10^{14} rads per second. Experience also is provided in the handling and use of many different radioisotopes. The magnitude and variety of facilities and unique radiation projects at the Sloan-Kettering Institute and the Memorial Hospital are particularly pertinent for training in this area. An important feature is the coexistence of fundamental research and practical and clinical applications in the same center.

Special Interests of the Faculty

L. L. Anderson: radiation dosimetry
J. R. Bading: quantitative imaging in extraction of physiologic information
R. E. Bigler: *in vivo* neutron activation analysis
J. Fried: cytotoxic agents and the cell cycle; flow cytofluorometry
A. S. Gelbard: enzymatic synthesis of compounds labeled with short-lived isotopes
M. Graham: biomedical applications of digital image enhancement
J. H. Kim: hyperthermia, radiation and drug actions on cell systems
K. L. Kwok: computer applications
J. S. Laughlin: metabolic studies with radionuclide labeled compounds
R. Mohan: computer applications in radiation therapy
W. G. Myers: radiopharmaceuticals, history of nuclear medicine
B. Schmall: syntheses and use of radiopharmaceuticals
P. P. Sordillo: cyclotron-produced. short-lived radionuclides for cancer diagnosis and treatment
H. Weiss: fast time processes in biophysics and radiobiology
L. Zeitz: mechanisms of damage and repair in mammalian cells

Courses

1. Radiological Physics Lectures and problems. A series of hourly lectures and assigned problems in applied mathematics, fundamentals

of radiation physics, x-ray and radium treatment planning, diagnostic x-ray principles, radiation protection, and uses of radioactive isotopes. Hours by arrangement.

2. Radiobiology A semester course in fundamental radiobiology dealing with the effects of radiation on cells, viruses, and macromolecules, as well as on whole animals. The course also covers areas of radiation physics and radiation chemistry pertinent to radiobiology.

3. Advanced Biophysics Laboratory courses in each of the topics of radiation biophysics. Hours by arrangement.

4. Radiopharmaceutical Chemistry A tutorial course in radiopharmaceutical chemistry is offered for those students majoring or minoring in this subject. Hours by arrangement.

5. Biophysics Colloquia Reports on research in progress by faculty and outside lecturers. Required for majors in biophysics. Hours by arrangement.

Biostatistics

Faculty

N. L. Geller, S. Groshen, V. Miké, H. T. Thaler

Unit Chairperson

V. Miké, Sloan-Kettering Division, Schwartz Hall, Room 724, (212) 794-7546

Graduate work is offered leading to the Ph.D. degree in biostatistics. The program is designed to provide strong training in statistical theory and methodology and in statistical computing, combined with broad experience in data analysis and in collaborative research with biomedical investigators.

For admission to the program an applicant must have a baccalaureate degree in mathematics, statistics, or the equivalent. Graduate Record Examination scores in both the Aptitude Test (verbal and quantitative) and the Advanced Test in mathematics are ordinarily required. The student is expected to take the courses recommended by the Special Committee, satisfy two minor field requirements, participate in an internship program, and complete a dissertation. A written qualifying examination and the Admission to Candidacy Examination must be passed. There is no foreign language requirement, but proficiency in at least one computer programming language is expected.

The courses to be completed by each student, some in the form of tutorials, are determined by the Special Committee, after consideration of the student's academic background and research interests. In addition to basic probability theory and statistical inference, there is special emphasis on the design and analysis of clinical trials, and the development of skills in exploratory data analysis.

For the two minor fields the student may select from computer science, advanced probability, genetics, pharmacology, or any other area of study offered by the Graduate School of Medical Sciences. These minor fields may afford the student an opportunity to spend time working in a biological research laboratory.

Each student participates in an internship program in statistical consulting and collaborative research. General consulting is an important aspect of the work of a professional biostatistician. The student initially sits in on consulting sessions, then begins taking on such assignments under faculty supervision. He or she may also become involved in long-term collaborative research projects. The internship schedule will be arranged for each student by the Special Committee.

A doctoral dissertation in statistics involves the development of new theory or methodology under the direction of a faculty advisor. In this program, the student also has the option of working jointly with a statistician and a biomedical investigator. The thesis is then developed in response to a problem under investigation at this medical center, and the student is expected to demonstrate an ability to master the issues pertaining to an area of research in which he or she has no prior training, by interacting with an established scientist. The main responsibility for thesis guidance, however, is always carried by the statistical sponsor.

Special Interests of the Faculty

N. L. Geller: probability theory; nonparametric inference; data analysis
S. Groshen: survival analysis; log-linear models; statistical inference
V. Miké: robust inference; epidemiology; genetics
H. T. Thaler: applied probability; data analysis; statistical graphics

Courses

1. Biostatistics I: Introduction to Statistical Reasoning It is the aim of this course to help participants gain some insight into the theory underlying a probabilistic approach to the treatment of observational or experimental data, and to acquaint them with the most basic techniques of statistical analysis. First trimester. Staff.

2. Biostatistics II: Experimental Design and Curve Fitting Application of concepts introduced in Biostatistics I to the analysis of scientific data. Topics include statistical design of experiments, analysis of variance, correlation, and linear regression. Second trimester. Staff.

3. Survival Analysis and Clinical Trials Parametric and nonparametric models of survival times, exponential and Weibull distributions; life-table and Kaplan-Meier estimates; design of randomized clinical trials, concomitant variables, stratification, sample size determination; 2- and k-sample techniques for censored data; generalized Wilcoxon and log-rank tests, Cox regression. Third trimester. Staff.

4. Biostatistics Workshop Designed to provide experience in the use of modern computing equipment and statistical software for the analysis of scientific data. To be taken concurrently with Biostatistics I and II. First and second trimesters. Staff.

5. Exploratory Data Analysis Tabular and graphical representation of data; stem-and-leaf diagrams, box plots, multidimensional methods; data reduction; transformations and smoothing; resistant analyses of structured data; diagnostic use of residuals. One trimester. Given in alternate years.

6. Research Individual study supervised by a faculty member.

Cell Biology

Faculty

J. L. Biedler, Z. Darzynkiewicz, E. E. Deschner, M. Eisinger, D. P. Evenson, J. E. Fogh, E. A. Friedman, M. R. Melamed, M. B. Meyers, M. A. S. Moore, A. E. Silverstone, H. W. Snyder Jr., S. S. Sternberg, L. Thomas

Unit Chairperson

June L. Biedler, Walker Laboratory, Room 2131, (914) 698-1100, Ext. 243

The program in Cell Biology offers opportunities for advanced study of the structure and function of normal and transformed cells, with emphasis on the role of abnormal cell structures in experimental and human cancers. Based on a multidisciplinary approach, research is oriented toward an analysis of cell and tissue growth and differentation. Research methodologies and techniques include light and electron microscopy, cell fractionation and analysis of cell components, cell structure, cytogenetics, and flow cytometry.

Students will spend their first year in: 1) satisfying course and seminar requirements; 2) participating in laboratory rotations; and 3) initiating one or two minor projects. The Unit Chairman will serve as temporary major advisor during this time. At the end of the first year the student's performance will be reviewed and a Special Committee of three members will be selected. The Special Committee membership must provide multidisciplinary academic backgrounds. During the second academic year students should complete two minor projects, satisfy the requirements of the Admission to Candidacy Examination and initiate a thesis project.

Prerequisites for a major in Cell Biology include courses in chemistry (through organic), biochemistry, physics, mathematics (through calculus) and general biological sciences (botany, zoology, microbiology, cell biology); physical chemistry is recommended. Any of the requirements not completed at the undergraduate level must be completed prior to entering the program or during the first year of graduate study.

Graduate Record Examinations in both the Aptitude Test (verbal and quantitative) and the Advanced Test in biology or chemistry are required.

Programs will be determined individually on the basis of interest and prior experience. Students are expected to have knowledge of materials offered in the courses of the Unit and microscopic anatomy. Exemption from the courses can be granted following the successful completion of a written examination. Students majoring in cell biology may be advised to register for courses in molecular biology, genetics, biochemistry and biostatistics.

Special Interests of the Faculty

J. L. Biedler: somatic cell genetics and cytogenetics
Z. Darzynkiewicz: differentiation and carcinogenesis
E. E. Deschner: proliferation and differentiation of gastrointestinal epithelium
M. Eisinger: metastases and cell culture
D. P. Evenson: ultrastructure of RNA and DNA and RNA tumor virus
J. E. Fogh: cancer cell biology and virology
E. A. Friedman: growth and differentiation of normal and preneoplastic cells
M. R. Melamed: cytophysics and cytochemistry
M. B. Meyers: biochemical genetics
M. A. S. Moore: multipotential stem cells; granulopoiesis
A. E. Silverstone: molecular biology of the initial phase of chemical carcinogenesis; DNA polymerases
H. W. Snyder Jr.: murine leukemia surface proteins
S. S. Sternberg: pathology and drug toxicity
L. Thomas: microbial toxins and mycoplasma

Courses

1. Topics in Developmental and Cancer Cell Biology Staff and invited lecturers will discuss the latest research in general problems of cell structure and function; special features of the cancer cell phenotype; ontogeny of tumor cells; and the similarities and differences in normal and neoplastic differentiation in embryonic cells and the hematopoietic, nervous, and epithelial cell systems. The central focus will be on the specific macromolecular

basis for the phenomena in question. Problems of regulation from the standpoint of hormonal and growth factor differentiation signals will also be examined. Course will require extensive reading of review and research articles, and active student participation in discussion. Alternate years. Not offered 1982-83.

2. Selected Topics in Developmental and Cancer Cell Biology Current papers and review articles covering developmental aspects of the cancer cell phenotype (initiation, promotion, and metastasis), and normal and neoplastic differentiation in selected systems (hematopoietic, epidermal, liver, colon) will be discussed by students under supervision of staff members. Alternate years; offered 1982-83; first trimester; A. E. Silverstone and P. J. Higgins.

3. Flow Cytometry This brief tutorial will include lectures and demonstrations on the principles of cell measurements and sorting as they are applied to basic cell biology, with special emphasis on nucleic acid content, cell cycle analysis, differentiation and transformation. Z. Darzynkiewicz and staff.

4. Cell Culture Tutorial Short term courses in tissue culture techniques will be offered to a limited number of students in laboratories of cell biology unit members. Sessions can count as lab rotations or be expanded into minor projects. J. L. Biedler and staff.

5. Cellular Differentiation Journal Club A weekly informal discussion of recent publications or research of common interest in cell biology and differentiation. Participants are responsible for choosing a presentation for the week. E. A. Friedman and staff.

6. Students may be advised to participate in courses offered by the Field of Cell and Developmental Biology, Medical College Division.

Genetics and Molecular Biology

Faculty

K. Artzt, L. H. Augenlicht, I. Balazs, F. C. Bancroft, D. Bennett, Y. Ben-Shaul, P. Besmer, J. L. Biedler, R. S. K. Chaganti, S. Chen-Kiang, R. K. Cross, B. Dupont, N. G. Famulari, E. Fleissner, E. A. Friedman, S. L. Gupta, J. A. Gurr, W. D. Hardy, W. S. Hayward, P. J. Higgins, J. C. Jenson, I. A. Kourides, R. M. Krug, P. W. Melera, M. J. Modak, P. V. O'Donnell, A. I. Oliff, A. Pinter, O. Prakash, W. Prensky, N. H. Sarkar, G. C. Sen, M. R. Sherman, A. E. Silverstone, M. Siniscalco, H. W. Snyder Jr., E. Stavnezer, J. Stavnezer, P. Szabo, J. S. Tung

Unit Chairperson

F. C. Bancroft, Sloan-Kettering Division, Howard Laboratory, Room 910, (212) 794-6667

This program offers an opportunity to do advanced research at the molecular level in various research areas, including eukaryotic gene structure and function, viral gene expression, viral and chemical carcinogenesis, developmental and somatic cell genetics, cell growth and differentiation, mechanisms of hormone action, and immunogenetics. The courses offered are designed to equip students with a detailed understanding of modern concepts in genetics, virology and molecular biology and the ways in which these are brought to bear on the cancer problem.

A good background in genetics and biochemistry is required of students. Graduate Record Examinations in both the aptitude test (verbal and quantitative) and the advanced test in biology or chemistry are also required. Course work in the first year of graduate study is decided upon by students in consultation with advisors provided by the Unit. Some courses in other units of the Sloan-Kettering Division may be recommended, depending on the individual student's background. All students are also required to take three seminar courses and to carry out minor research projects in laboratories other than that of their major sponsor. A rotation program exists to aid students in choosing their major thesis topic and sponsor.

Special Interests of the Faculty

K. Artzt: cell surfaces and tumorigenesis in early mouse embryogenesis
L. H. Augenlicht: transcriptional control, eukaryotes
I. Balazs: RNA characterization; transcription and translation in man-mouse cell hybrids
F. C. Bancroft: expression and regulation of genes for growth hormone and prolactin
D. Bennett: developmental genetics and differentiation
Y. Ben-Shaul: developmental genetics
P. Besmer: structural and functional analysis of transforming genes of new feline sarcoma virus isolates; identification and characterization of feline leukemia virus-induced cellular transforming genes
J. L. Biedler: somatic cell genetics and oncogenic potential
R. S. Chaganti: cytogenetics and cancer
S. Chen-Kiang: transcription and processing of adenovircus-2 mRNA

R. K. Cross: viral genetics
B. Dupont: human immunogenetics
N. G. Famulari: leukemogenesis by murine leukemia viruses: the role of viral proteins
E. Fleissner: molecular, biological, and immunological studies of murine leukemia viruses
E. A. Friedman: growth and differentiation of normal and preneoplastic cells; tumor progression in human colon
S. L. Gupta: interferon mechanisms and cell regulation
J. A. Gurr: thyroid stimulating hormone; regulation of gene expression
W. D. Hardy Jr.: feline lymphosarcoma (leukemia)
W. S. Hayward: viral and cellular gene expression, and their relationship to viral-induced cell transformation
P. J. Higgins: comparative biochemistry of embryonic and neoplastic development
J. C. Jenson: nuclear proteins and chromatin structure; macromolecular targets for chemical carcinogens
I. A. Kourides: hormonal regulation of thyroid stimulating hormone gene expression; β-endorphin in pituitary hormone regulation, behavior, and analgesia
R. M. Krug: biochemistry of transcription, translation and viral replication
P. V. Melera: regulatory mechanisms of eukaryotic gene expression; somatic cell gene amplification
M. Modak: DNA polymerase; reverse transcriptase; oncogenic viruses
P. V. O'Donnell: characterization of murine leukemia viruses; surface antigens and peptide analysis of glycoproteins
A. I. Oliff: molecular biology of genetic susceptibility to leukemia and other neoplasms
A. Pinter: characterization of structure and function of murine leukemia and sarcoma virus-coded proteins
O. Prakash: enzymology of reovirus replication
W. Prensky: molecular cytogenetics
N. H. Sarkar: morphology of RNA oncogenic viruses
G. Sen: regulation of gene expression in eukaryotic cells
M. Sherman: mechanisms of steroid hormone action
A. E. Silverstone: molecular biology of the initial phase of chemical carcinogenesis; DNA polymerases
M. Siniscalco: somatic cell genetics
H. W. Snyder: characterization of feline lymphosarcoma and murine leukemia cell surface proteins
E. Stavnezer: organization of eukaryotic genomes; regulation of RNA synthesis
J. Stavnezer: studies by recombinant DNA techniques of structure and rearrangement of immunoglobulin genes
P. Szabo: eukaryotic genome organization; molecular analysis of viral and host genome interactions
J. S. Tung: biochemistry and immunogenetics of mouse cell surface antigens

Courses

1. Molecular Biology (Advanced Biochemistry II) The course presents the fundamentals of eukaryote gene structure, expression and regulation. Topics discussed include: DNA sequence organization, chromatin structure, viral and cellular RNA transcription, translation and its regulation, control of gene expression in model systems and molecular aspects of carcinogenesis. Third trimester. G. C. Sen and staff.

2. Advanced Genetics Designed to give the student a sound background in genetic theory; an in-depth consideration of the gene as a unit of heredity. First trimester. Alternate years. Not offered in 1982-83.

3. Molecular Virology A formal course in which major emphasis is placed on the basic mechanisms in the biology of all animal viruses, including RNA and DNA tumor viruses. The topics considered include virus structure and composition, assay of viruses and viral-specific products, transcription and replication of viral nucleic acids, translation of virus-specific proteins, assembly of viral particles, structural and functional alterations in viral-infected cells including transformation, pathogenesis of viral diseases, and viral genetics. Alternate years. Not offered in 1982-83.

4. Molecular Biology of Neoplastic Transformation This course will focus on current efforts to understand the neoplastic cell phenotype from a molecular point of view. The effects of RNA and DNA tumor viruses on host cells will be discussed, in particular the transformation and/or differentiation blocks of defined cell lineages by certain agents. The nature and enzymatic specificities of viral gene products responsible for transformation will be compared with related products of normal cellular genes. The potential interaction of such products with regulatory systems controlling cell shape, adhesiveness, motility, and mitosis will be described, as well as the possible involvement of the same systems in nonviral neoplasias. At least part of the course will consist of student presentations on relevant subjects. Alternate years. Offered in 1982-83, third trimester. E. Fleissner, P. Besmer and A. Silverstone.

5. Advanced Molecular Genetics A seminar course for advanced students covering those areas of gene structure and expression in which rapid progress is being made. Second trimester. Staff.

Immunology

Faculty

J. Abbott, R. S. Anderson, E. A. Boyse, H. E. Broxmeyer, J.-W. Chiao, Y. S. Choi, C. Cunningham-Rundles, M. A. B. De Sousa, B. Dupont, R. L. Evans, Y. Hirshaut, M. K. Hoffmann, G. Incefy, Y. B. Kim, M. E. Kirch, G. C. Koo, E. C. Lattime, G. W. Litman, C. Lopez, S. Macphail, V. J. Merluzzi, H. F. Oettgen, L. J. Old, R. J. O'Reilly, R. Pahwa, C. D. Platsoucas, M. S. Pollack, P. M. Ralph, B. Safai, M. P. Scheid, F.-W. Shen, J. Stavnezer, O. Stutman, K. A. Sullivan

Unit Chairperson

O. Stutman, Sloan-Kettering Division, Kettering Laboratory, Room 1118, (212) 794-7475

Opportunities are offered toward the Ph.D. degree in various areas of immunology. This includes the disciplines of immunobiology, immunochemistry, immunogenetics, immunohematology, immunopathology, immunopharmacology, serology, transplantation immunology, tumor immunology, immunotherapy, and clinical immunology.

Undergraduate prerequisites for a major in immunology include courses in inorganic chemistry, organic chemistry, mathematics (through calculus), physics, and general biology, microbiology, zoology or botany. Physical chemistry is recommended. Any of these requirements not completed at the undergraduate level must be completed during the first year of graduate study.

Graduate Record Examinations in both Aptitude Tests and the Advanced Test in biology or chemistry are required.

Programs are determined individually on the basis of interest, training, prior experience and consultation with the student's Special Committee. The Unit has no fixed course work requirements other than those set by the student's permanent Special Committee. However, all students majoring in the program are expected to take full advantage of the Unit's core program of formal courses as well as to participate in additional course offerings of the Sloan-Kettering Division, Medical College Division, and other institutions which best complement their previous background and fulfill their scholastic objectives. During the first year of residence prior to the selection of a permanent Special Committee, the Unit chairperson, acting as temporary major sponsor, in consultation with the other members of the temporary Special Committee will aid the student in making the appropriate program choices. However, it is the clear intention of the Unit that extensive formal course work should not interfere with participation in the various other activities, such as rotations, tutorials and minicourses as well as seminars and lectures offered at Sloan-Kettering Institute and neighboring institutions.

The permanent Special Committee is to be composed of three members of the faculty—two minor sponsors and a major sponsor as chairperson. Minor projects should be completed before the Admission to Candidacy Examination required by the Graduate School of Medical Sciences.

Special Interests of the Faculty

J. Abbott: differentiation and cell surface antigens

R. S. Anderson: impact of pollutants on immune systems of marine invertebrates; metabolism of carcinogens by invertebrates; comparative immunobiology

E. A. Boyse: immunogenetics of the cell surface

H. E. Broxmeyer: regulation of granulocyte and macrophage production *in vivo* and *in vitro* during health and leukemia

J. W. Chiao: immunobiology of T lymphocytes in immunity and leukemia

Y. S. Choi: immunochemistry of lymphocyte receptors

C. Cunningham-Rundles: immunochemistry of immune complexes; cell surface antigens; clinical immunology; enzyme-linked immunosorbant assay (ELISA)

M. A. B. de Sousa: circulation of lymphocytes; iron and control of immune functions

B. Dupont: human immunogenetics

R. L. Evans: immunology of T cells; immunoregulatory and cytotoxic activities

Y. Hirshaut: human tumor antigens

M. K. Hoffman: regulation of humoral immunity in mouse and man

G. Incefy: *In vitro* human T lymphocyte differentiation, thymic hormones, thymus function, immunodeficiency diseases

Y. B. Kim: ontogeny of immune systems; ontogeny and regulation of NK/K cell systems

M. E. Kirch: tumor immunology; regulation of tumor cell growth

G. C. Koo: immunogenetics of surface antigens of lymphoid cells

E. C. Lattime: natural cell-mediated immunity; lyphokine production and regulation; thymus processing

G. W. Litman: immunogenetics, protein structure and function; multigenic organization

C. Lopez: resistance to herpes-virus infections; anti-herpes-virus chemotherapy; natural cell-mediated cytotoxicity

S. Macphail: MHC and non-MHC immunogenetics; cytotoxic T lymphocyte activity and regulation

V. J. Merluzzi: regulation of cellular immunity by antineoplastic and immunopharmacological agents

H. F. Oettgen: definition of cancer cell surface antigens recognized by antibodies or cytotoxic T cells; cancer immunotherapy

L. J. Old: cancer immunology and immunotherapy
R. J. O'Reilly: microbial immunology; bone marrow transplantation; immuno-deficiencies
R. Pahwa: T cell differentiation in man; biological activities of thymic stroma and thymic hormones
C. D. Platsoucas: human regulatory and effector T cells; T-T cell hybrids
M. S. Pollack: immunogenetics of human histocompatibility alloantigens
P. Ralph: macrophage cytotoxicity; leukemic cell lines; human Ig secretion
B. Safai: characteristics of the epidermal cells and their differentiation; cutaneous T cell lymphomas
M. P. Scheid: lymphocyte development; immunogenetics, defects, therapy
F.-W. Shen: immunogenetics of the mouse
J. Stavnezer: molecular immunology: structure and functioning of immunoglobulin genes
O. Stutman: cellular immunology; thymus and T cells (development and function); tumor immunology; natural cell-mediated cytotoxicity
K. A. Sullivan: human lymphocyte subsets; cell-mediated lympholysis

Courses

Introductory Immunology, Advanced Immunology or Clinical Immunology (alternate), and Contemporary Topics in Immunology are offered as core formal course work every year. When appropriate, students will be encouraged to participate in the Biochemistry, Genetics, Molecular Biology and Biostatistics courses. Cell Biology and Microscopic Anatomy should be considered by those students lacking a background in these areas. At present, participation in the graduate seminar course is required by the Division.

1. Introductory Immunology This course is appropriate for but not restricted to students who have had no formal training in immunology or who wish to review fundamentals in preparation for the Advanced Immunology course. An overview of specific and nonspecific immunity, historical perspectives in immunology, cellular participants in immune responses, structure of immunoglobulins and cell surface receptors, molecular basis of antibody diversity, organization of lymphoid tissues and cell migration streams, phylogenetic perspectives on vertebrate immunity, specificity to immune responses, methods for measuring humoral immune responses, immunogenetics and transplantation immunity, and methods for measuring cell-mediated immune responses are among the topics which will be considered. First trimester, P. Ralph, V. J. Merluzzi, and staff.

2. Advanced Immunology Lectures, discussions and assigned readings for in-depth studies to cover properties of antigens and antibodies; mechanism of antibody formation; phylogeny and ontogeny of the immune system; structural and functional aspects of the immune system; molecular basis of antibody and lymphocyte diversity; major histocompatibility complexes in man and animals; immunogenetics of differentiation; effector mechanisms of antibody and cell-mediated immunity; mechanisms of immune injuries; immunodeficiency diseases; regulation and control of the immune response; genetics and immunology of transplants and tumors. Prerequisites for the course are at least one semester or equivalent biochemistry and introductory immunology. Second trimester, Y. B. Kim, O. Stutman, and staff.

3. Clinical Immunology Lectures, discussion and assigned readings on subjects related to clinical immunology such as histocompatibility antigens; properties of T, B and macrophage cells; lymphoid cell lines; immunopathology; immunodeficiencies; immunogenetics; organ and bone marrow transplantation; tumor immunology etc. Prerequisites are the Introductory Immunology or equivalent course. Will be given on alternate years with the Advanced Immunology course (beginning in 1983-84), second trimester. Staff.

4. Contemporary Topics in Immunology The course will deal with two to four topics per trimester. Individual sessions may consist of discussions of selected topics, covering current progress by staff, student and/or invited visitors. Topics will be selected by the Curriculum Committee in consultation with staff. Prerequisites are the Introductory and Advanced Immunology courses or equivalent. Second and third trimesters. Staff.

5. Laboratory Rotations, Tutorials and Minicourses In order to become familiar with the various research programs which are available to students doing major or minor work in Immunology the Unit advises entering students to participate in as many laboratory rotations, tutorials and minicourses as can be accommodated into the first-year schedule. The lists and descriptions for laboratory rotations, tutorial programs and minicourses are available from the office of the Unit chairperson. Staff.

Pharmacology and Experimental Therapeutics

Faculty

N. W. Alcock, T.-C. Chou, J. J. Fox, A. Giner-Sorolla, D. J. Hutchison, G. Incefy, B. M. Mehta, H. F. Oettgen, B. A. Otter, J. C. Parham, F. S. Philips, J. Roberts, A. E. Silverstone, F. M. Sirotnak, S. S. Sternberg, K. A. Watanabe, M. S. Zedeck

Unit Chairperson

F. M. Sirotnak, Sloan-Kettering Division, Kettering Laboratory, Room 316, (212) 794-7952

This graduate program emphasizes training in general pharmacology. The candidate receives advanced instruction and training in one or more of the following subspecialties: biochemical and molecular pharmacology, medicinal chemistry and biochemistry, cancer therapeutics, immunopharmacology, carcinogenesis and toxicology and radiopharmacology. The latter part of the curriculum is devoted to individual research in an area selected by the candidate.

Applicants must meet the general requirements for admission to the Sloan-Kettering Division. Graduates with a major in biology, chemistry or health sciences having adequate preliminary training in organic chemistry, physical chemistry, biochemistry and physiology would be most qualified for graduate work in this unit. Training in statistics is recommended. Graduate Record Examinations in both the Aptitude Tests (verbal and quantitative) and the Advanced Test in biology or chemistry are required.

Courses generally required for an advanced degree include Biochemistry, Microanatomy, Physiology, Neurosciences, Biostatistics and both General and Advanced Pharmacology. Students may receive credit for equivalent course work at other institutions. Students may also be required to take a number of electives and seminar and special topics course. Individual programs may vary as determined by the student's Special Committee composed of faculty members representing the major and minor fields of study.

Special Interests of the Faculty

N. W. Alcock: trace metals, parenteral nutrition
T.-C. Chou: molecular pharmacology and enzymology
J. J. Fox: nucleoside analog chemistry
A. Giner-Sorolla: synthesis of antitumor and antiviral chemicals, carcinogenesis
D. J. Hutchison: drug resistance, cytoregulation and microbiology
G. Incefy: lymphocyte (T and B cells) differentiation
B. H. Mehta: quantitative microbiology, genetics, pharmacokinetics
H. Oettgen: immunotherapy
B. A. Otter: synthesis of antitumor agents
J. C. Parham: synthesis of antitumor agents, chemical carcinogenesis
F. S. Philips: pharmacology of antitumor and carcinogenic agents
J. Roberts: antitumor enzymes and nutritional deprivation of neoplasm
A. E. Silverstone: molecular carcinogenesis
F. M. Sirotnak: molecular pharmacology and membrane transport of antimetabolites
S. S. Sternberg: pathology of drug action
K. A. Watanabe: medicinal chemistry and biochemistry, pyrimidine nucleoside analogs
M. S. Zedeck: mechanisms of chemical carcinogenesis; biochemistry of antitumor drugs

Courses

1. General Pharmacology (see Field of Pharmacology, Medical College Division).

2. Advanced Pharmacology (Interdivisional). This course will amplify the general pharmacology course focusing on basic aspects such as drug metabolism, enzyme kinetics, pharmacokinetics, pharmacogenetics, receptors, chemotherapy, drug resistance, membrane transport, toxicology and clinical pharmacology.

3. Molecular Pharmacology (see Field of Pharmacology, Medical College Division).

4. Immunopharmacology As a melding of pharmacology and immunology this course focuses on the mechanism of therapeutic immunologic regulation. Topics include: inflammatory and allergic processes; mechanism of cell activation; mediated release and action; cyclic-nucleotides and prostaglandins; lymphokines, interferons and thymic hormones; immunotoxicology; immunologic assays and uses of biologics and drugs for immunotherapy. A background in immunology would be helpful but not required. Offered every second year.

5. Pharmacology Seminar (Interdivisional). The content and format of this seminar course is determined each year on the basis of the research interests of the faculty and students.

6. Special Topics Course (Interunit). This course is interdisciplinary and will expand the candidate's training in certain specialized areas such as pharmacologic effects on membrane structure and physiology, radiopharmacology, chemical carcinogenesis and medicinal biochemistry.

Interdivisional Course

1. Graduate Biochemistry Offered by the staffs of the Field of Biochemistry, Medical College Division, and of the Biochemistry Unit, Sloan-Kettering Division. This course is designed to provide the student with a knowledge of the fundamentals of biochemistry and an appreciation of the molecular basis of biological phenomena. Graduate students in biochemistry are required to pass this course

(or its equivalent). Fall and winter trimesters. S. G. Powers, K. O. Lloyd and staff.

Special Programs

Ph.D.-M.D. Program

Students enrolled in the Graduate School of Medical Sciences may be eligible for admission into the Ph.D.-M.D. Program, jointly sponsored by the Medical College and the Graduate School of Medical Sciences. This program is designed for those few graduate students whose teaching and research goals require the acquisition of the M.D. degree in addition to the Ph.D. degree. The program is *not* designed as an alternate path for students who have the M.D. degree as their primary goal, but who have not been accepted by a medical school. Those who know, at the time of application to Cornell, that they want to pursue a course of study leading to both degrees should apply to one of the M.D.-Ph.D. programs of the Medical College described below. Only students enrolled in the Graduate School of Medical Sciences, or accepted for enrollment, may apply for admission to the Ph.D.-M.D. Program at Cornell University Medical College.

Requirements for Admission

Applications to this program are ordinarily made after completion of the first year of study in the Graduate School of Medical Sciences, although more advanced students may be considered. The deadline for application is February 1.

To apply, the student must submit to the Ph.D.-M.D. Committee of the Graduate School of Medical Sciences:
1. A completed application for admission with advanced standing to Cornell University Medical College (obtainable from the Medical College Admissions Office).
2. A plan of graduate study incorporating all required course work of the first two years of the Medical College curriculum and endorsed by the student's Special Committee.
3. Evidence of successful completion of at least two major medical school basic science courses (anatomical sciences, biochemistry, microbiology, pathology, pharmacology, physiology).
4. Two letters of evaluation from faculty of the Graduate School of Medical Sciences.

The Ph.D.-M.D. Committee of the Graduate School of Medical Sciences will review the student's credentials and will select from among the applicants those students to be considered by the Committee on Admissions of Cornell University Medical College. Only applicants who are found to be acceptable for admission to Cornell University Medical College by its Committee on Admissions, after review of the application and a personal interview, will be accepted into the Ph.D.-M.D. Program. Final decisions will be made before June 1.

Degree Requirements

Students accepted in this program must fulfill the following requirements before admission to the third year clinical curriculum of the Medical College:
1. Complete all required graduate courses and the remainder of the first two years of the medical curriculum. The students must satisfy the academic requirements of the medical curriculum as these are determined by each of the departments of the first two years.
2. Pass the Admission to Candidacy Examination required by the Graduate School of Medical Sciences.
3. Complete the dissertation research; present and successfully defend an original thesis at the final examination for the Ph.D. degree.

After satisfactory fulfillment of the required clinical rotations of the Cornell third-year medical curriculum, these students may receive credit for their graduate studies to satisfy the elective requirements of the fourth-year medical curriculum and will then be recommended for award of the M.D. degree by Cornell University.

While registered as a graduate student in the Ph.D.-M.D. program the student is subject to the tuition schedule of the Graduate School of Medical Sciences. Upon completion of the requirements for the Ph.D. degree, the student is registered in the Medical College and is subject to the tuition schedule of the Cornell University Medical College.

M.D.-Ph.D. Program

Programs of study leading to the Ph.D. degree are available to (1) students entering Cornell University Medical College, (2) medical students already matriculated at the Medical College, and (3) resident physicians in hospitals affiliated with the Medical College.

Entering Medical Students

The applicant to this program for entering medical students must apply to both the Cornell University Medical College and the Graduate School of Medical Sciences and be accepted through the admissions procedures of both schools.

The purpose of this program is to expose the student to both medical and graduate disciplines from the outset. The student spends the first two years as a medical student studying the basic medical sciences and attending regular graduate seminars. The summer months are spent in the laboratory learning experimental techniques and doing research. The third, fourth, and fifth years of the student's program are spent as a full-time graduate student and are devoted ex-

clusively to laboratory research and writing the thesis. The sixth year of the program is spent as a medical student in clinical study. This six-year program represents the minimum time required to satisfy residence requirements of both the M.D. and Ph.D. degrees at Cornell University.

Ordinarily an entering medical student accepted into the M.D.-Ph.D. program will initially register in both the Cornell University Medical College and the Graduate School of Medical Sciences. For the first and second years of the program, the student ordinarily will maintain registration as a full-time medical student. The student may accumulate residence credit in the Graduate School of Medical Sciences for full-time graduate study during the summer.

During the third and fourth years of the M.D.-Ph.D. program, a student ordinarily will be registered as a full-time graduate student. In general, a student will be registered in both the Cornell University Medical College and the Graduate School of Medical Sciences during the last year of study for the Ph.D., which in most cases will be the fifth year of the program. During the final year of the program, usually the sixth year, a student will be registered only in the Cornell University Medical College.

A student in the M.D.-Ph.D. program is liable for tuition to the school in which registered. During the year in which the student is registered in both the Cornell University Medical College and the Graduate School of Medical Sciences, the student will be liable for half the tuition to each school.

Matriculated Medical Students

A medical student enrolled in the Cornell University Medical College may interrupt medical studies at any time to pursue full-time graduate study leading to the Ph.D. degree. The student must fulfill all regular requirements of the Graduate School of Medical Sciences. A maximum of two residence credits for basic sciences course work taken in the medical curriculum can be granted toward the Ph.D. degree after the student passes an evaluation examination.

A medical student who elects to begin graduate work leading to the Ph.D. degree in the senior year of medical school may register in both the Cornell University Medical College and the Graduate School of Medical Sciences. The student begins his or her graduate didactic work during that year, and, ordinarily, the M.D. degree is granted at the end of that year. Research in the area of the Ph.D. thesis topic is begun during the fifth year. A two-year period of full-time research is a realistic minimum estimate for the time required to execute the experimental and theoretical work necessary to fulfill the requirements for the Ph.D. degree.

Resident Physicians

The resident physician may apply for admission to the Graduate School of Medical Sciences as a full-time graduate student working toward the Ph.D. Part-time graduate study is not permitted. A maximum of two residence credits for medical school course work in the basic sciences can be granted toward the residence requirements of the Ph.D. degree after the student passes an evaluation examination.

Prospective applicants to these programs should communicate with the dean of the Graduate School of Medical Sciences.

Cornell University
Graduate School of Medical Sciences

Register

University Administration

Frank H. T. Rhodes, President of the University
W. Keith Kennedy, University Provost
Thomas H. Meikle, Jr., Provost for Medical Affairs
William G. Herbster, Senior Vice President
W. Donald Cooke, Vice President for Research
William D. Gurowitz, Vice President for Campus Affairs
Robert T. Horn, Vice President, Treasurer, and Chief Investment Officer
Robert M. Matyas, Vice President for Facilities and Business Operations
Richard M. Ramin, Vice President for Public Affairs
Alison P. Casarett, Vice Provost
Larry I. Palmer, Vice Provost
James W. Spencer, Vice Provost
Walter J. Relihan, Jr., Secretary of the Corporation and University Counsel
Neal R. Stamp, Senior Counsel to the University
Kenneth I. Greisen, Dean of the University Faculty

Graduate School of Medical Sciences

Administration

Frank H. T. Rhodes, President of the University
Alison P. Casarett, Dean of the Graduate School
Dieter H. Sussdorf, Acting Dean of the Graduate School of Medical Sciences and Acting Associate Dean of the Graduate School
Richard A. Rifkind, Director, Sloan-Kettering Division
Dorris J. Hutchison, Associate Director, Sloan-Kettering Division; Associate Dean of the Graduate School of Medical Sciences, Assistant Dean of the Graduate School

Faculty

Joan Abbott, Assistant Professor of Immunology. B.A. 1954, Connecticut College; M.A. 1957, Washington University; Ph.D. 1965, University of Pennsylvania

Nancy W. Alcock, Assistant Professor of Biochemistry and Pharmacology & Experimental Therapeutics. B.S. 1949, University of Tasmania (Australia); Ph.D. 1960, University of London (England)

Fred H. Allen, Jr., Clnical Associate Professor of Pediatrics. A.B. 1934, Amherst College; M.D. 1938, Harvard University

Vincent G. Allfrey, Adjunct Professor of Genetics. B.S. 1943, City College of New York; M.S. 1948, Ph.D. 1949, Columbia University

Daniel R. Alonso, Associate Professor of Pathology. M.D. 1962, University of Cuyo (Argentina)

Olaf S. Andersen, Associate Professor of Physiology and Biophysics. Candidatus Medicinae 1971, University of Copenhagen (Denmark)

Lowell L. Anderson, Visiting Assistant Professo of Biophysics. B.S. 1953, Whitworth College; Ph.D. 1958, University of Rochester

Robert S. Anderson, Assistant Professor of Immunology. B.S. 1961, Drexel University; M.S. 1968, Hahnemann Medical College; Ph.D. 1971, University of Delaware

Karen Artzt, Associate Professor of Genetics & Molecular Biology. A.B. 1964, Ph.D. 1972, Cornell University

Leonard H. Augenlicht, Assistant Professor of Biochemistry and Genetics & Molecular Biology. B.A. 1967, State University of New York at Binghamton; Ph.D. 1971, Syracuse University

Rosemary F. Bachvarova, Assistant Professor of Genetics. B.A. 1961, Radcliffe College; Ph.D. 1966, Rockefeller University

Thomas Baker, Research Associate Professor of Pharmacology. A.B. 1968, Hunter College; M.S. 1971, Cornell University

Ivan Balazs, Assistant Professor of Biochemistry and Genetics & Molecular Biology. Ph.D. 1972, Albert Einstein College of Medicine

M. Earl Balis, Professor of Biochemistry. B.A. 1943, Temple University; Ph.D. 1949, University of Pennsylvania

F. Carter Bancroft, Associate Professor of Genetics & Molecular Biology & Cell Biology. B.S. 1959, Antioch College; M.A. 1961, Johns Hopkins University; Ph.D. 1966, University of California at Berkeley

Carl G. Becker, Professor of Pathology. B.S. 1957, Yale University; M.D. 1961, Cornell University

J. Michael Bedford, Professor of Cell Biology and Anatomy. B.A. 1955, M.A. Vet. M.B. 1958,

Cambridge University (England); Ph.D. 1965, University of London (England)

Dorothea Bennett, Professor of Genetics & Molecular Biology. A.B. 1951, Barnard College; Ph.D. 1956, Columbia University

Yehuda Ben-Shaul, Visiting Professor of Genetics & Molecular Biology, M.Sc. 1958, Ph.D. 1962, Hebrew University (Israel)

Barry A. Berkowitz, Adjunct Associate Professor of Pharmacology. B.S. 1964, Northeastern University; Ph.D. 1968, University of California

Peter Besmer, Assistant Professor of Genetics and Molecular Biology, M.S. 1964, Ph.D. 1969 Eigenossische Technische Hohschule (Switzerland)

Celso Bianco, Adjunct Professor of Cell Biology. M.D. 1966, Escola Paulista de Medicina (Sao Paulo, Brazil)

June L. Biedler, Professor of Genetics & Molecular Biology and Cell Biology. A.B. 1947, Vassar College; Ph.D. 1959, Cornell University

Rodney E. Bigler, Assistant Professor of Biophysics. B.S. 1966, Portland State University; Ph.D. 1971, University of Texas

Ira B. Black, Associate Professor of Neurology. A.B. 1961, Columbia College; M.D. 1965, Harvard University

John P. Blass, Professor of Neurology and Medicine, A.B. 1958, Harvard University, Ph.D. 1960, University of London (England), M.D. 1965, Columbia University

Richard S. Bockman, Assistant Professor of Biochemistry. B.A. 1962, Johns Hopkins University; M.D. 1967, Yale University; Ph.D. 1971, Rockefeller University

Ellen Borenfreund, Associate Professor of Biochemistry. B.S. 1946, Hunter College; Ph.D. 1957, New York University

Adele L. Boskey, Assistant Professor of Biochemistry. B.A. 1964, Barnard College; Ph.D. 1970, Boston University

Edward A. Boyse, Professor of Immunology. M.B.B.S. 1952, M.D. 1957, University of London (England)

Esther M. Breslow, Professor of Biochemistry. B.S. 1953, Cornell University; M.S. 1955, Ph.D. 1959, New York University

William A. Briscoe, Professor of Medicine. B.A. 1939, M.A. 1941, B.M.B.Ch. 1942, D.M. 1951, Oxford University (England)

Dana C. Brooks, Professor of Cell Biology and Anatomy. B.E.E. 1949, M.D. 1957, Cornell University

George B. Brown, Emeritus Professor of Biochemistry. B.S. 1934, Illinois Wesleyan University; Ph.D. 1938, University of Illinois

Hal E. Broxmeyer, Assistant Professor of Immunology. B.S. 1966, Brooklyn College; M.S. 1969, Long Island University; Ph.D. 1973, New York University

Peter Bullough, Associate Professor of Pathology. M.D. 1956, Liverpool University (England)

John J. Burns, Adjunct Professor of Pharmacology. B.S. 1942, Queens College; M.A. 1948, Ph.D. 1950, Columbia University

Liebe F. Cavalieri, Professor of Biochemistry. B.S. 1943, Ph.D. 1945, University of Pennsylvania

R. S. K. Chaganti, Assistant Professor of Genetics & Molecular Biology. B.S. 1954, M.S. 1955, Andhra University (India); Ph.D. 1964, Harvard University

Walter W. Y. Chan, Professor of Pharmacology. B.A. 1956, University of Wisconsin; Ph.D. 1961, Columbia University

Selina Y. Chen-Kiang, Assistant Professor of Genetics and Molecular Biology. B.S. 1965, National Taiwan University, Ph.D. 1977, Columbia University

Jen-Wei Chiao, Assistant Professor of Immunology. B.S. 1966, Southwestern University; M.S. 1968, Ph.D. 1971, University of Illinois Medical Center

Yong S. Choi, Professor of Immunology, M.D. 1961, Seoul National University (Korea); M.S., Ph.D. 1965, University of Minnesota

Ting-Chao Chou, Associate Professor of Pharmacology & Experimental Therapeutics. B.S. 1961, Kaohsiung Medical College (Taiwan); M.S. 1965, National Taiwan University; Ph.D. 1970, Yale University

Arthur J. L. Cooper, Assistant Professor of Biochemistry (Neurology). B.Sc. 1967, M.Sc. 1969, University of London (England); Ph.D. 1974, Cornell University

James S. Cornell, Assistant Professor of Biochemistry. B.S. 1969, Michigan State University; Ph.D. 1973, University of California at Los Angeles

Charlotte Cunningham-Rundles, Assistant Professor of Immunology and Biochemistry. B.S. 1965, Duke University; M.D. 1969, Columbia College of Physicians and Surgeons; Ph.D. 1974, New York University

B. Shannon Danes, Associate Professor of Medicine. B.A. 1948, Mount Holyoke College; M.A. 1949, University of Texas; Ph.D. 1952, State University of Iowa; M.D. 1962, Columbia University

Farrington Daniels, Jr., Professor of Medicine and Public Health. B.A. 1940, University of Wisconsin; M.D. 1943, Harvard University

Zbigniew Darzynkiewicz, Associate Professor of Biochemistry and Cell Biology. M.D. 1960, Academy of Medicine, Warsaw (Poland); Ph.D. 1965, Academy of Medicine and Polish Academy of Sciences (Poland)

Eleanor E. Deschner, Assistant Professor of Cell Biology and Pharmacology & Experimental Therapeutics. B.A. 1949, Notre Dame of Staten Island; M.S. 1951, Ph.D. 1954, Fordham University

Maria A. B. de Sousa, Associate Professor of Immunology. M.D. 1963, Lisbon Medical Faculty (Portugal); Ph.D. 1971, University of Glasgow (Scotland); M.R.C. 1973, Royal College of Pathologists (England)

Robert W. Dickerman, Associate Professor of

Microbiology. B.S. 1951, Cornell University; M.A. 1953, University of Arizona; Ph.D. 1961, University of Minnesota

David B. Donner, Assistant Professor of Biochemistry. B.A. 1966, Queens College; Ph.D. 1972, Rensselaer Polytechnic Institute

John W. Dougherty, Clinical Associate Professor of Medicine. B.S. 1941, M.D. 1943, University of Minnesota

Dennis E. Drayer, Research Associate Professor of Pharmacology. B.S. 1966, Brooklyn College; Ph.D. 1971, University of Delaware

Thomas E. Duffy, Associate Professor of Biochemistry in Neurology; Assistant Professor of Biochemistry (Neurology). B.S. 1962, Loyola University; Ph.D. 1967, University of Maryland

Bo Dupont, Professor of Immunology and Genetics & Molecular Biology. M.D. 1966, University of Arhus (Denmark)

Magdalena G. Eisinger, Assistant Professor of Cell Biology. D.V.M. 1962, Agricultural University Kosice (Czechoslovakia)

John T. Ellis, Professor of Pathology. B.A. 1942, University of Texas; M.D. 1945, Northwestern University

Robert L. Evans, Assistant Professor of Immunology. M.D. 1972, University of Washington

Donald P. Evenson, Assistant Professor of Cell Biology. B.A. 1964, Augustana College; Ph.D. 1968, University of Colorado

Gordon F. Fairclough, Associate Professor of Biochemistry. B.A. 1960, Ph.D. 1966, Yale University

Nancy G. Famulari, Assistant Professor of Genetics and Molecular Biology. B.A. 1968, Colby College, Ph.D. 1974, Cornell University

Colin Fell, Associate Professor of Physiology and Biophysics. B.A. 1951, Antioch College; M.S. 1953, Ph.D. 1957, Wayne State University

Donald A. Fischman, Professor of Cell Biology and Anatomy (Chairman). Harvey Klein Professor of Biomedical Sciences. A.B. 1957, Kenyon College; M.D. 1961, Cornell University

Martin Fleisher, Assistant Professor of Biochemistry. B.A. 1958, Harpur College; Ph.D. 1966, New York University

Erwin Fleissner, Professor of Genetics & Molecular Biology. B.A. 1957, Yale University; Ph.D. 1963, Columbia University

Jorgen E. Fogh, Associate Professor of Cell Biology. M.D. 1949, University of Copenhagen (Denmark)

Frank W. Foote, Jr., Emeritus Professor of Pathology. B.A. 1931, M.D. 1935, University of Virginia

Jack J. Fox, Professor of Biochemistry and Pharmacology & Experimental Therapeutics. A.B. 1939, Ph.D. 1950, University of Colorado

Jerrold Fried, Associate Professor of Biophysics. B.S. 1958, California Institute of Technology; Ph.D. 1964, Stanford University

Eileen A. Friedman, Assistant Professor of Cell Biology and Genetics & Molecular Biology. A.B. 1967, New York University; Ph.D. 1972, Johns Hopkins University

Gustavo Frindt, Assistant Professor of Physiology and Biophysics. M.D. 1963, Catholic University of Chile

Daniel Gardner, Associate Professor of Physiology and Biophysics. A.B. 1966, Columbia College; Ph.D. 1971, New York University

Jerald D. Gass, Associate Professor of Biochemistry. B.S. 1957, University of Oklahoma; A.M. 1962, Harvard University; Ph.D. 1969, Cornell University

Michael S. Gazzaniga, Professor of Neuropsychology. A.B. 1961, Dartmouth College; Ph.D. 1964, California Institute of Technology

Alan S. Gelbard, Associate Professor of Biophysics. B.S. 1955, Brooklyn College; M.S. 1956, University of Massachusetts; Ph.D. 1959, University of Wisconsin

Nancy L. Geller, Assistant Professor of Biostatistics. B.S. 1965, City University of New York; M.A. 1967, Case Institute of Technology; Ph.D. 1972, Case Western Reserve University

James L. German III, Clinical Professor of Anatomy. B.S. 1945, Louisiana Polytechnic Institute; M.D. 1949, Southwestern Medical College

James G. Gibbs, Jr., Assistant Professor of Psychiatry. B.S. 1960, Trinity College; M.D. 1964, Medical College of South Carolina

Gary E. Gibson, Assistant Professor of Neurology. B.S. 1968, University of Wyoming; Ph.D. 1973, Cornell University

Helena Gilder, Associate Professor of Biochemistry in Surgery; Assistant Professor of Biochemistry. A.B. 1935, Vassar College; M.D. 1940, Cornell University

Alfredo Giner-Sorollo, Associate Professor of Biochemistry and Pharmacology & Experimental Therapeutics. M.S. 1944, University of Valencia (Spain); Ph.D. 1958, Cornell University

Fakhry Girgis, Associate Professor of Cell Biology and Anatomy. M.B.B.Ch. 1949, Cairo University (Egypt); Ph.D. 1957, Queen's University (Northern Ireland)

Jack Goldstein, Associate Professor of Biochemistry. B.A. 1952, Brooklyn College; M.N.S. 1957, Ph.D. 1959, Cornell University

Robert A. Good, Adjunct Professor of Immunology. B.A. 1944, M.B. 1946, M.D. 1947, University of Minnesota

Lloyd H. Graf, Jr., Assistant Professor of Genetics in Obstetrics and Gynecology. B.S. 1967 and Ph.D. 1972, Duke University

Bernice Grafstein, Professor of Physiology and Biophysics. B.A. 1951, University of Toronto (Canada); Ph.D. 1954, McGill University (Canada)

Saul Green, Associate Professor of Biochemistry. B.S. 1948, City College of New York; Ph.D. 1952, State University of Iowa

Roger L. Greif, Emeritus Professor of Physiology and Biophysics. B.S. 1937, Haverford College; M.D. 1941, Johns Hopkins University

Owen W. Griffith, Associate Professor of Biochemistry. B.A. 1968, University of California at Berkeley; Ph.D. 1976, Rockefeller University

Susan Groshen, Assistant Professor of Biostatistics. A.B. 1973, Cornell University, M.S. 1976, Ph.D. 1980, Rutgers University

Sohan Lal Gupta, Assistant Professor of Genetics and Molecular Biology. M.S. 1960, Aligarh Muslim University, Aligarh (India), Ph.D. 1967, All India Institute of Medical Sciences, New Delhi (India)

Wilbur D. Hagamen, Professor of Cell Biology and Anatomy. B.S. 1945, Baldwin-Wallace College; M.D. 1951, Cornell University

David Hajjar, Assistant Professor of Pathology. B.A. 1974, American International College; M.S. 1977, Ph.D. 1978, University of New Hampshire

Katherine A. Halmi, Associate Professor of Psychiatry. B.A. 1961, University of Iowa; M.D. 1965, University of Iowa

Martin D. Hamburg, Adjunct Assistant Professor of Cell Biology and Anatomy. B.A. 1965, New York University; Ph.D. 1969, University of Michigan

Ulrich G. Hämmerling, Associate Professor of Biochemistry. B.A. 1959, Freie Universität Berlin; M.A. 1961, Albert Ludwigs Universität; Ph.D. 1965, Max Planck Institut fuer Immunobiologie (Germany)

William D. Hardy, Jr., Assistant Professor of Genetics & Molecular Biology. A.A. 1960, B.S. 1962, George Washington University; V.M.D. 1966, University of Pennsylvania

Zsolt P. Harsanyi, Adjunct Assistant Professor of Microbiology. B.A. 1965, Amherst College; Ph.D. 1970, Albert Einstein College of Medicine

Rudy H. Haschemeyer, Professor of Biochemistry. B.A. 1952, Carthage College; Ph.D. 1957, University of Illinois

William S. Hayward, Professor of Genetics and Molecular Biology. B.A. 1964, University of California, Riverside, Ph.D. 1969, University of Southern California, San Diego

Erich Heinz, Professor of Physiology and Biophysics. M.D. 1939, University of Munster and Kiel (Germany)

Paul J. Higgins, Assistant Professor of Biochemistry and Genetics & Molecular Biology. B.S. 1969, Iona College; M.S. 1973, Long Island University; Ph.D. 1976, New York University

Lawrence E. Hinkle, Jr., Professor of Medicine; Professor of Medicine in Psychiatry. Attending Physician, New York Hospital. B.A. 1938, University of North Carolina; M.D. 1942, Harvard University

Yashar Hirshaut, Assistant Professor of Immunology. B.A. 1959, Yeshiva University; M.D. 1963, Albert Einstein College of Medicine

Michael K. Hoffman, Associate Professor of Immunology. M.D. 1966, Universität Tubingen (Germany)

Bernard L. Horecker, Adjunct Professor of Biochemistry. B.S. 1936, Ph.D. 1939, University of Chicago

Raymond W. Houde, Associate Professor of Pharmacology. A. B. 1940, M.D. 1943, New York University

Dorris J. Hutchison, Professor of Pharmacology & Experimental Therapeutics. B.S. 1940, Western Kentucky State College; M.S. 1943, University of Kentucky; Ph.D. 1949, Rutgers University

Genevieve Incefy, Assistant Professor of Immunology and Pharmacology & Experimental Therapeutics. B.Sc. 1959, M.Sc. 1960, Ph.D. 1964, Ohio State University

Charles E. Inturrisi, Professor of Pharmacology. B.S. 1962, University of Connecticut; M.S. 1965, Ph.D. 1967, Tulane University

Norman B. Javitt, Professor of Medicine. A.B. 1947, Syracuse University; Ph.D. 1951, University of North Carolina; M.D. 1954, Duke University

Tong Hyub Joh, Associate Professor of Neurobiology in Neurology. B.S. 1953, Seoul National University (Korea); M.S. 1965, University of Missouri; Ph.D. 1971, New York University

Edward M. Johnson, Adjunct Assistant Professor of Genetics. B.A. 1967, Pomona College; Ph.D. 1971, Yale University

Brian R. Jones, Assistant Professor of Pharmacology. B.Sc. 1970, University of London (England); M.B.B.S. 1973, St. Mary's Hospital School of the University of London (England)

Thomas Clifford Jones, Professor of Medicine. B.A. 1958, Allegheny College; M.D. 1962, Case Western Reserve University

Robert F. Kaiko, Adjunct Assistant Professor of Pharmacology. B.S. 1970, University of Connecticut; Ph.D. 1974, Cornell University

Barry B. Kaplan, Assistant Professor of Anatomy. B.A. 1968, M.A. 1969, Hofstra University; Ph.D. 1974, Cornell University

Jan S. Keithly, Assistant Professor of Microbiology, Assistant Professor of Microbiology in Medicine. B.S. 1963, Central Missouri State University, Ph.D. 1968, Iowa State University

Aaron Kellner, Clinical Professor of Pathology. B.A. 1934, Yeshiva College; M.S. 1936, Columbia University; M.D. 1939, University of Chicago

John A. Kessler, Assistant Professor of Neurology. A.B. 1967, Princeton University; M.D. 1971, Cornell University

Yoon B. Kim, Professor of Immunology. M.D. 1958, School of Medicine, Seoul National University (Korea); Ph.D. 1965, University of Minnesota

Jae Ho Kim, Associate Professor of Biophysics. M.D. 1959, Kyungpook National School of Medicine (Korea); Ph.D. 1963, State University of Iowa

Gloria C. Koo, Assistant Professor of Immunology. B.A. 1965, Goshen College; Ph.D. 1970, Temple University

Levy Kopelovich, Associate Professor of Biochemistry and Pharmacology & Experimental Therapeutics. B.S. 1958, Hebrew University (Israel); Ph.D. 1962, University of California

Ione A. Kourides, Associate Professor of Genetics & Molecular Biology. B.A. 1963, Wellesley College; M.D. 1967, Harvard University

Robert M. Krug, Professor of Genetics & Molecular Biology. B.A. 1961, Harvard University; Ph.D. 1966, Rockefeller University

Raju S. Kucherlapati, Adjunct Assistant Professor. B.S. 1960, P.R. College (India); M.S. 1962, Andhra University (India); Ph.D. 1972, University of Illinois

Henn Kutt, Associate Professor of Pharmacology. M.D. 1950, University of Frankfurt (Germany)

John S. Laughlin, Professor of Biophysics. A.B. 1940, Willamette University; Ph.D. 1947, University of Illinois

Chin Ok Lee, Assistant Professor of Physiology and Biophysics. M.S. 1967, Seoul National University (Korea); Ph.D. 1973, Indiana School of Medicine

Roberto Levi, Professor of Pharmacology. M.D. 1960, University of Florence (Italy)

Daniel E. Levy, Associate Professor of Neurology. A.B. 1963, M.D. 1968, Harvard University

Kenneth W. Lieberman, Assistant Professor of Biochemistry in Psychiatry. B.A. 1960, Brooklyn College; M.S. 1963, Texas Technological College; Ph.D. 1966, University of Kentucky

Martin Lipkin, Professor of Medicine. A.B. 1946, M.D. 1950, New York University

Gary W. Litman, Associate Professor of Immunology. B.A. 1967, Ph.D. 1972, University of Minnesota

Kenneth O. Lloyd, Assistant Professor of Biochemistry. Ph.D. 1960, University College of North Wales (England)

Carlos Lopez, Associate Professor of Immunology. B.A. 1965, M.S. 1966, Ph.D. 1970, University of Minnesota

Thomas M. Maack, Professor of Physiology and Biophysics. M.D. 1962, University of Sao Paulo (Brazil)

John MacLeod, Emeritus Professor of Anatomy. A.B. 1934, M.Sc. 1937, New York University; Ph.D. 1941, Cornell University

Bipin M. Mehta, Assistant Professor of Pharmacology & Experimental Therapeutics. B.Sc. 1955, M.Sc. 1957, Ph.D. 1963, Bombay University (India)

Thomas H. Meikle, Jr., Professor of Cell Biology and Anatomy. A.B. 1951, M.D. 1954, Cornell University

Alton Meister, Israel Rogosin Professor of Biochemistry. B.S. 1942, Harvard University; M.D. 1945, Cornell University

Myron R. Melamed, Professor of Cell Biology. B.S. 1947, Western Reserve University; M.D. 1950, University of Cincinnati

Peter W. Melera, Assistant Professor of Biochemistry and Genetics & Molecular Biology. A.A.S. 1963, State University of New York at Cobleskill; B.S.A. 1965, Ph.D. 1969, University of Georgia

Robert C. Mellors, Professor of Pathology. A.B. 1937, M.A. 1938, Ph.D. 1940, Western Reserve University; M.D. 1944, Johns Hopkins University

Steven R. Meshnik, Assistant Professor of Medicine. B.A. 1972, Columbia University; Ph.D. 1978, Rockefeller University

Valerie Miké, Professor of Biostatistics. B.A. 1956, Manhattanville College; M.S. 1959, Ph.D. 1967, New York University

C. Richard Minick, Professor of Pathology. B.S. 1957, University of Wyoming; M.D. 1960, Cornell University

Mukund J. Modak, Associate Professor of Biochemistry and Genetics & Molecular Biology. B.Sc. 1963, University of Poona (India); M.Sc. 1965, University of Bombay (India); Ph.D. 1969, Haffkine Institute, University of Bombay (India)

Radhe Mohan, Visiting Assistant Professor of Biophysics. B.S. 1959, M.S. 1963, Punjabi University (India); Ph.D. 1969, Duke University

Hong Mo Moon, Adjunct Professor of Neurobiology. B.S. 1961, Sung Kyun Kwan University (Korea); Ph.D. 1967, University of North Carolina

Anne C. Moore, Assistant Professor of Biochemistry. B.A. 1970, Carleton College; Ph.D. 1976, University of California, Berkeley

Malcolm A. S. Moore, Professor of Cell Biology. M.B. 1963, B.A. 1964, D. Phil. 1967, M.A. 1970, Oxford University (England)

George E. Murphy, Professor of Pathology. A.B. 1939, University of Kansas; M.D. 1943, University of Pennsylvania

William G. Myers, Visiting Professor of Biophysics. A.B. 1933, M.Sc. 1937, Ph.D. 1939, M.D. 1941, Ohio State University

Ralph L. Nachman, Professor of Medicine. A.B. 1953, M.D. 1956, Vanderbilt University

Jerome S. Nisselbaum, Associate Professor of Biochemistry. B.A. 1949, University of Connecticut; Ph.D. 1953, Tufts University

Abraham Novogrodsky, Associate Professor of Biochemistry. M.D. 1960, Hebrew University Medical School, Jerusalem; Ph.D. 1974, Weizmann Institute of Science, Rehovot (Israel)

Paul V. O'Donnell, Assistant Professor of Genetics & Molecular Biology. B.S. 1968, Rensselaer Polytechnic Institute; Ph.D. 1973, Cornell University

Herbert F. Oettgen, Professor of Immunology and Pharmacology & Experimental Therapeutics. M.D. 1951, University of Cologne (Germany)

Michiko Okamoto, Professor of Pharmacology. B.S. 1954, Tokyo College of Pharmacy (Japan); M.S. 1957, Purdue University; Ph.D. 1964, Cornell University

Lloyd J. Old, Professor of Immunology. B.A. 1955, M.D. 1958, University of California

William M. O'Leary, Professor of Microbiology. B.S. 1952, M.S. 1953, Ph.D. 1957, University of Pittsburgh

Allen I. Oliff, Assistant Professor of Genetics and Molecular Biology. B.S. 1971, Brandeis University; M.D. 1974, Einstein College of Medicine

Richard J. O'Reilly, Assistant Professor of Immunology. A.B. 1964, College of the Holy Cross; M.D. 1968, University of Rochester

Brian J. Otter, Assistant Professor of Biochemistry and Pharmacology & Experimental Therapeutics. B.Sc. 1962, Ph.D. 1965, University of Bristol (England)

Rajendra N. Pahwa, Assistant Professor of Immunology. M.B.B.S. 1966, M.D. 1969, Indore Medical College (India)

Lawrence G. Palmer, Assistant Professor of Physiology and Biophysics. B.A. 1970, Swarthmore College; Ph.D. 1976, University of Pennsylvania

James C. Parham, Associate Professor of Biochemistry and Pharmacology & Experimental Therapeutics. B.S. 1959, Bates College; Ph.D. 1963, Duke University

Gavril W. Pasternak, Assistant Professor of Pharmacology. B.A. 1969, M.D. 1973, Ph.D. 1974, Johns Hopkins University

Carol K. Petito, Assistant Professor of Pathology. BS. 1963, Jackson College; M.D. 1967, Columbia University

Frederick S. Philips, Professor of Pharmacology & Experimental Therapeutics. B.A. 1936, Columbia University; Ph.D. 1940, University of Rochester

Virginia Pickel, Assistant Professor of Neurology. B.S. 1965, M.S. 1967, University of Tennessee; Ph.D. 1970, Vanderbilt University

Thomas G. Pickering, Associate Professor of Medicine. B.A. 1962, M.A. 1968, Cambridge University (England); Ph.D. 1970, Oxford University (England)

Abraham Pinter, Assistant Professor of Genetics & Molecular Biology. B.Sc. 1969, Brooklyn College; Ph.D. 1973, Columbia University

Chris D. Platsoukas, Assistant Professor of Immunology. B.S. 1973, University of Patras (Greece); Ph.D. 1978, Massachusetts Institute of Technology

Fred Plum, Anne Parrish Titzell Professor of Neurology. B.A. 1944, Dartmouth College; M.D. 1947, Cornell University

Marilyn S. Pollack, Assistant Professor of Immunology. A.B. 1961, M.A. 1963, University of California at Berkeley; Ph.D. 1968, Rutgers University

Aaron S. Posner, Professor of Biochemistry. B.S. 1941, Rutgers University; M.S. 1949, Polytechnic Institute of Brooklyn; Ph.D. 1954, University of Liege (Belgium)

Sue G. Powers-Lee, Assistant Professor of Biochemistry. B.S. 1969, University of Kentucky; Ph.D. 1974, University of California at Berkeley

Wolf Prensky, Assistant Professor of Genetics & Molecular Biology. B.S. 1953, Cornell University; M.S. 1957, Ph.D. 1961, University of Illinois

Alfred M. Prince, Clinical Associate Professor of Pathology. A.B. 1949, Yale University; M.A. 1951, Columbia University; M.D. 1955, Western Reserve University

Enrique M. Rabellino, Assistant Professor of Medicine. B.S. 1959, Institute J. M. Paz (Argentina); M.D. 1965, University of Cordoba (Argentina)

Julian R. Rachele, Emeritus Professor of Biochemistry. B.A. 1934, M.S. 1935, Ph.D. 1939, New York University

Peter M. Ralph, Associate Professor of Immunology. B.A. 1958, Yale University; M.A. 1960, University of California at Berkeley; Ph.D. 1968, Massachusetts Institute of Technology

Joan K. Rankin, Assistant Professor of Cell Biology. B.S. 1960, Westminister College; M.S. 1968, New York University; M.A. 1970, Hofstra University; Ph.D. 1979, Cornell University

Marcus M. Reidenberg, Professor of Pharmacology. B.S. 1954, Cornell University; M.D. 1958, Temple University

Donald J. Reis, Professor of Neurology. A.B. 1953, M.D. 1956, Cornell University

Arleen B. Rifkind, Associate Professor of Pharmacology; Assistant Professor of Medicine. B.A. 1960, Bryn Mawr College; M.D. 1964, New York University

Robert Riggio, Professor of Biochemistry. B.A. 1954, Dartmouth College; M.D. 1958, New York University

Walter F. Riker, Jr., Professor of Pharmacology. B.S. 1939, Columbia University; M.D. 1943, Cornell University

Michael Risley, Assistant Professor of Cell Biology and Anatomy. B.S. 1970, Manhattan College; Ph.D. 1976, City University of New York

Joseph Roberts, Associate Professor of Biochemistry and Pharmacology & Experimental Therapeutics. B.Sc., 1959, University of Toronto (Canada); M.S. 1962, University of Wisconsin; Ph.D. 1964, McGill University (Canada)

Richard B. Roberts, Professor of Medicine. B.A. 1955, Dartmouth College; M.D. 1959, Temple University

Toby C. Rodman, Associate Professor of Cell Biology and Anatomy. B.S. 1937, Philadelphia College of Pharmacy and Science; M.S. 1961, Ph.D. 1963, New York University

Barbara Rosenberg, Associate Professor of Biochemistry. B.S. 1960, Ph.D. 1962, Cornell University

Albert L. Rubin, Professor of Biochemistry in Surgery. M.D. 1950, Cornell University

Pablo Rubenstein, Adjunct Associate Professor of Genetics. Ph.D. 1964, Universidad de Chile

Henry J. Sackin, Assistant Professor of Physiology and Biophysics. B.S., B.A. 1970, M.S. 1971, Brown University; Ph.D. 1978, Yale University

Bijan Safai, Assistant Professor of Immunology. M.D. 1965, University of Teheran Medical School (Iran)

F. Kingsley Sanders, Emeritus Professor of Cell Biology. B.A. 1939, Ph.D. 1942, Oxford University (England)

Charles A. Santos-Buch, Professor of Pathology. A.B. 1953, Harvard University; M.D. 1957, Cornell University

Nurul H. Sarkar, Associate Professor of Genetics & Molecular Biology. B.S. 1957, M.S. 1960, Ph.D. 1966, University of Calcutta (India)

Brij B. Saxena, Professor of Endocrinology in Obstetrics and Gynecology. Ph.D. 1954, University of Lucknow (India); D.Sc. 1957, University of Muenster (Germany); Ph.D. 1961, University of Wisconsin

Margrit P. Scheid, Associate Professor of Immunology. M.D. 1970, Physiologisches Institut der Freien Universität Berlin (Germany)

Allan S. Schneider, Associate Professor of Biochemistry. B.Ch.E. 1961, Rensselaer Polytechnic Institute; M.S. 1963, Pennsylvania State University; Ph.D. 1968, University of California at Berkeley

William N. Schoenfeld, Adjunct Professor of Psychology in Psychiatry. B.S. 1937, City College of New York; A.M. 1939, Ph.D. 1942, Columbia University

Edward T. Schubert, Assistant Professor of Biochemistry in Pediatrics. B.S. 1949, M.S. 1952, Ph.D. 1959, Fordham University

Morton K. Schwartz, Professor of Biochemistry. B.A. 1948, Lehigh University; Ph.D. 1952, Boston University

Jeri A. Sechzer, Associate Professor of Psychology in Psychiatry. B.S. 1956, New York University; M.A. 1961, Ph.D. 1962, University of Pennsylvania

Ganes C. Sen, Assistant Professor of Biochemistry and Genetics & Molecular Biology. B.S. 1965, M.S. 1967, Calcutta University (India); Ph.D. 1974, McMaster University (Canada)

Laurence B. Senterfit, Associate Professor of Microbiology. B.S. 1949, M.S. 1950, University of Florida; Sc.D. 1955, Johns Hopkins University

Fung-Win Shen, Assistant Professor of Immunology. B.S. 1968, Fu-Jen Catholic University (Taiwan); M.S. 1971, Ph.D. 1973, University of New Mexico

Merry M. Sherman, Associate Professor of Biochemistry and Genetics & Molecular Biology. B.A. 1961, Wellesley College; M.A. 1963, Ph.D. 1966, University of California at Berkeley

Selma Silagi, Professor of Genetics in Obstetrics and Gynecology. A.B. 1936, Hunter College; Ph.D. 1961, Columbia University

Allen E. Silverstone, Assistant Professor of Cell Biology, Genetics & Molecular Biology and Pharmacology & Exerimental Therapeutics. B.A. 1964, Reed College; Ph.D. 1970, Massachusetts Institute of Technology

Marcello Siniscalco, Professor of Genetics & Molecular Biology. M.D. 1948, University of Naples (Italy)

Julio L. Sirlin, Professor of Cell Biology and Anatomy. D.Sc. 1953, University of Buenos Aires (Argentina)

Francis M. Sirotnak, Professor of Pharmacology & Experimental Therapeutics. B.S. 1950, University of Scranton; Ph.D. 1954, University of Maryland

Gregory W. Siskind, Professor of Medicine. B.A. 1955, Cornell University; M.D. 1959, New York University

Gerard P. Smith, Professor of Psychiatry (Behavioral Science). B.S. 1956, St. Joseph's College; M.D. 1960, University of Pennsylvania

Harry W. Snyder, Jr., Assistant Professor of Cell Biology and Genetics & Molecular Biology. B.A. 1969, Johns Hopkins University; Ph.D. 1974, Georgetown University

Richard L. Soffer, Professor of Biochemistry and Medicine. B.A. 1954, Amherst College; M.D. 1958, Harvard University

David Soifer, Adjunct Assistant Professor of Cell Biology and Anatomy. B.S. 1961, Columbia University; Ph.D. 1969, Cornell University

Martin Sonenberg, Professor of Biochemistry. B.S. 1941, University of Pennsylvania; M.D. 1944, Ph.D. 1952, New York University

Edward Stavnezer, Assistant Professor of Genetics & Molecular Biology. B.A. 1965, M.S. 1967, University of Connecticut; Ph.D. 1971, Johns Hopkins University

Janet Stavnezer, Assistant Professor of Immunology and Genetics & Molecular Biology. B.A. 1966, Swarthmore College; Ph.D. 1971, Johns Hopkins University

Kurt H. Stenzel, Professor of Biochemistry in Surgery. B.S. 1954, New York University; M.D. 1958, Cornell University

Stephen S. Sternberg, Professor of Pharmacology & Experimental Therapeutics and Associate Professor of Cell Biology. B.A. 1941, Colby College; M.D. 1944, New York University

Fred W. Stewart, Emeritus Professor of Pathology. A.B. 1916, Ph.D. 1919, Cornell University; M.D. 1924, Harvard University

C. Chester Stock, Emeritus Professor of Biochemistry. B.S. 1932, Rose Polytechnic Institute; Ph.D. 1937, Johns Hopkins University

Gerhard Stöhrer, Associate Professor of Biochemistry. Ph.D. 1965, Freie Universität Berlin (Germany)

Peter E. Stokes, Associate Professor of Medicine and Psychiatry. B.S. 1948, Trinity College; M.D. 1952, Cornell University

Osias Stutman, Professor of Immunology. B.A. 1950, Colegio Nacional Sarmiento (Argentina); M.D. 1957, Buenos Aires University Medical School (Argentina)

Karen A. Sullivan, Assistant Professor of Immunology. B.S. 1966, North Adams State College; Ph.D. 1973, Duke University

Myron Susin, Clinical Associate Professor of Pathology. B.A. 1956, Augustana College; M.D. 1960, University of Illinois

Dieter H. Sussdorf, Associate Professor of Microbiology. B.A. 1952, University of Kansas City; Ph.D. 1956, University of Chicago

Roy C. Swan, Joseph C. Hinsey Professor of Cell Biology and Anatomy. A.B. 1941, M.D. 1947, Cornell University

Hazel H. Szeto, Assistant Professor of Pharmacology. B.S. 1972, Indiana University; Ph.D., M.D. 1977, Cornell University

William T. Talman, Assistant Professor of Neurology, Assistant Attending Neurologist, New York Hospital. B.A. 1966, Virginia Military Institute; M.D. 1970, University of Virginia

Suresh S. Tate, Associate Professor of Biochemistry. B.Sc. 1958, M.Sc. 1960, University of Baroda (India); Ph.D. 1963, University of London (England)

Gladys N. Teitelman, Assistant Professor of Neurobiology in Neurology. Licenciada in Biology 1962, University of Buenos Aires (Argentina); Ph.D. 1971, University of Pennsylvania

Howard Thaler, Assistant Professor of Biostatistics. B.A. 1967, University of California at Los Angeles; Ph.D. 1974, State University of New York at Buffalo

Lewis Thomas, Professor of Cell Biology. B.S. 1933, Princeton University; M.D. 1937, Harvard University; M.A. 1969, Yale University

Paul P. Trotta, Assistant Professor of Biochemistry. A.B. 1964, Columbia University; Ph.D. 1968, State University of New York Downstate Medical Center

Jwu-Sheng Tung, Assistant Professor of Genetics & Molecular Biology. B.A. 1959, National Taiwan University (Taiwan); M.S. 1966, Ph.D. 1971, University of California at Berkeley

Sidney Udenfriend, Adjunct Professor of Biochemistry. B.S. 1939, City College of New York; M.S. 1942, Ph.D. 1948, New York University

Stephen S. Wachtel, Associate Research Professor in Pediatrics. A.B. 1959, Kenyon College; Ph.D. 1971, University of Pennsylvania

Kyoichi A. Watanabe, Professor of Pharmacology and Experimental Therapeutics. Ph.D. 1963, Hokkaido University (Japan)

John Weber, Associate Professor of Cell Biology and Anatomy. B.A. 1961, D.D.S. 1965, Columbia University

Alan M. Weinstein, Assistant Professor of Physiology and Biophysics. A.B. 1971, Princeton University; M.D. 1975, Harvard University

Marc E. Weksler, Associate Professor of Medicine. B.A. 1958, Swarthmore College; M.D. 1962, Columbia University

Daniel Wellner, Associate Professor of Biochemistry. A.B. 1956, Harvard University; Ph.D. 1961, Tufts University

Michael E. Wiebe, Assistant Professor of Microbiology. B.A. 1965, Sterling College; Ph.D. 1971, University of Kansas

Robert J. Winchester, Adjunct Associate Professor of Genetics. B.S. 1958, Manhattan College; M.D. 1963, Cornell University

Erich H. Windhager, Professor of Physiology and Biophysics. M.D. 1954, University of Vienna (Austria)

Kenneth R. Woods, Associate Professor of Biochemistry. B.A. 1948, Arizona State University; Ph.D. 1955, University of Minnesota

Lily C. Yip, Assistant Professor of Biochemistry. Ph.D. 1965, University of Cincinnati

Morris S. Zedeck, Associate Professor of Pharmacology & Experimental Therapeutics. B.S. 1961, Brooklyn College of Pharmacy; Ph.D. 1965, University of Michigan

Louis Zeitz, Associate Professor of Biophysics. A.B. 1948, University of California; Ph.D. 1962, Stanford University

Degree Recipients 1981-82

Doctors of Philosophy

Althea P. Kintanar Alton, B.S. 1976, University of the Philippines. Major: genetics. Manila, Philippines

Steven L. Bernstein, B.Sc. 1975, Philadelphia College of Pharmacy and Science. Major: neurobiology and behavior. Philadelphia, Pennsylvania

Carolyn A. Blanckmeister, B.A. 1975, State University of New York at Brockport; M.S. 1980, Cornell University. Major: microbiology. Mineola, New York

Ann M. Carroll, B.S. 1977, St. John's University. Major: immunology. Williston Park, New York

Yung-Wu Chen, B.S. 1972, M.S. 1976, National Taiwan University. Major: microbiology. Changhua, Taiwan

D. Louise Edwards, A.B. 1974, Mount Holyoke College. Major: neurobiology and behavior. Corning, New York

Arthur Englard, B.S. 1971, Brooklyn College. Major: immunology. Brooklyn, New York

Joseph A. Fedrick, B.A. 1973, New York University. Major: microbiology. Bronx, New York

Daniela S. Gerhard, B.A. 1976, Barnard College. Major: biochemistry. Flushing, New York

Carolyn W. Herz, A.B. 1973, Smith College. Major: genetics. New York, New York

Rae J. Jacobs, B.S. 1975, Rutgers University; R.N. 1960, Bellevue School of Nursing. Major: cell biology. New York, New York

Gene K. Potter, B.A. 1961, Yeshiva University; D.P.M. 1966, New York College of Podiatric Medicine. Major: pathology. Croton-on-Hudson, New York

Margery J. Ross, B.A. 1973, University of California at San Diego. Major: immunology. Salinas, California

Robert Rothlein, B.A. 1972, University of Vermont; M.S. 1978, University of Minnesota. Major: immunology. New York, New York

William O. Sandals, B.S. 1975, C. W. Post College. Major: genetics. Coram, New York

Rise Schwab, B.S. 1971, State University of New York at Stony Brook. Major: genetics. Jackson Heights, New York

Lisa F. Staiano-Coico, B.S. 1976, Brooklyn College. Major: microbiology. Brooklyn, New York

Doris R. Stanick, B.S. 1975, College of Mt. St. Vincent. Major: microbiology. Glendale, New York

Jason G. Umans, B.S. 1976, Rensselaer Polytechnic Institute. Major: pharmacology. Cedarhurst, New York

John E. Van Hamont, B.A. 1972, St. Anselm's College; M.S. 1976, Long Island University. Major: microbiology. Brooklyn, New York

Miryam Z. Wahrman, B.A. 1976, Hunter College. Major: biochemistry. New York, New York

Pasquale B. Zanzonico, B.S. 1977, The Cooper Union School of Engineering and Science. Major: biophysics. Brooklyn, New York

* Leave of absence

Masters of Science

Laura M. Aaronson, B.A. 1973, Brandeis University; M.S. 1977, Northeastern University. Major: pharmacology. Boston, Massachusetts

Michael Kurkowski, B.A. 1971, Pratt Institute. Major: pharmacology and experimental therapeutics. Brooklyn, New York

Students 1982-83

Candidates for the Degree of Doctor of Philosophy

Alberto M. Acosta, B.A. 1978, Columbia University. Major: pathology. Havana, Cuba

Vivian Risa Albert, B.A. 1979, M.S. 1980, Stanford University. Major: neurobiology and behavior. Los Angeles, California

Philip Alcabes, B.S. 1976, Union College; M.A. 1978, University of California at Berkeley; M.P.H. 1981, Columbia University. Major: pathology. Brooklyn, New York

Mary E. Anderson, B.A. 1977, Hollins College. Major: biochemistry. San Antonio, Texas

Angelo N. Arnold, B.S. 1972, State University of New York at Stony Brook; M.S. 1978, C. W. Post. Major: biochemistry. Brooklyn, New York

Frederick K. Askari, B.A. 1981, Cornell University. Major: pharmacology. Toledo, Ohio

David K. Batter, B.S. 1979, University of Connecticut. Major: neurobiology and behavior. New Haven, Connecticut

E. Edward Baetge, B.A. 1978, University of California at San Diego. Major: neurobiology and behavior. Fort Monmouth, New Jersey

Ann R. Beaton, B.S. 1976, Cornell University. Major: genetics and molecular biology. Port Chester, New York

Linda S. Belkowski, BA. 1979, Rutgers University. Major: genetics and molecular biology. Perth Amboy, New Jersey

Peter J. Bergold, B.S. 1977, Trinity College. Major: immunology. Teaneck, New Jersey

*Richard C. Binari, B.S. 1977, University of Notre Dame. Major: genetics and molecular biology. Cambridge, Massachusetts

Seymour G. Blank, B.E.E. 1965, City University of New York; M.E.E. 1968, New York University. Major: physiology and biophysics. Brooklyn, New York

Janet Braam, B.S. 1980, Southern Illinois. Major: biology. Chicago, Illinois

Lynn A. Brennan, B.A. 1974, Rutgers University. Major: genetics and molecular biology. New York, New York

Richard J. Bridges, A.S. 1975, Santa Rosa Junior College; B.S. 1977, University of California at Davis. Major: biochemistry. Santa Rosa, California

David Brodeur, B.S. 1979, College of William and Mary. Major: genetics and molecular biology. Brooklyn, New York

James A. Burke, B.A. 1975, Gettysburg College; M.S. 1977, Adelphi University. Major: pharmacology. Garden City, New York

Jacqueline P. Burns, B.S. 1978, Marymount Manhattan College. Major: genetics and molecular biology. New York, New York

Marion Man-Ying Chan, B.S. 1975, M.S. 1978, University of Maryland. Major: immunology. Hong Kong

Edward Chaum, B.A. 1979, Johns Hopkins University. Major: genetics. Los Angeles, California

Chun-Chang Chen, B.S. 1977, Taiwan University. Major: biochemistry. Taipei, Taiwan

Yao-Tseng Chen, B.Med. 1981, College of Medicine, National Taiwan University. Major: immunology. Tainan, Taiwan

Margaret K. Cheung, B.S. 1978, University of Michigan. Major: immunology. Hong Kong

Michael J. Chorney, B.S. 1975, M.S. 1977, Lehigh University. Major: genetics. Allentown, Pennsylvania

Janet Wing Choy, A.B. 1977, Smith College. Major: biological structure and cell biology. Wayne, New Jersey

Bruce E. Clurman, B.A. 1981, University of Virginia. Major: genetics and molecular biology. Cherry Hill, New Jersey

Joseph M. Colacino, B.A. 1975, University of Connecticut; M.S. 1979, Southern Connecticut State College. Major: immunology. New Haven, Connecticut

Clemencia Colmenares, B.S. 1976, Yale University. Major: immunology. Bogota, Columbia

Peter S. Conti, B.A. 1978, Johns Hopkins University. Major: biophysics. Yonkers, New York

Carlos B. Cordon-Cardo, M.D. 1980, Autonomous University (Spain). Major: pathology. Calella, Spain

George N. Davatelis, B.A. 1977, Montclair State College; M.S. 1979, University of Hawaii. Major: genetics. Paterson, New Jersey

Margaret Devaney, B.S., B.A. 1977, University of Pennsylvania. Major: microbiology. Lancaster, Pennsylvania

Eugene A. DiPaola, B.S. 1974, Manhattan College. Major: genetics. Boston, Massachusetts

Lynn Anne Doucette, B.Sc. 1981, McMaster University (Canada). Major: genetics. Toronto, Canada

Vladimir V. Drozdoff, B.A. 1979, Bowdoin College. Major: biophysics. Cooper, Maine

Steven Einheber, B.S. 1981, George Washington University. Major: cell and developmental biology. Washington, D.C.

Susan M. Fitzpatrick, B.S. 1978, St. John's University. Major: biochemistry. Brooklyn, New York

*Tiyi R. Freeman, B.S. 1970, Cheyney State College; M.D. 1974, Jefferson Memorial College. Major: immunology. Bronx, New York

Garland J. Garrisi, B.A. 1977, Colgate University; M.S. 1979, Boston College. Major: genetics and molecular biology. Detroit, Michigan

Jamshid Ghajar, B.A. 1973, M.A. 1975, University of California at Los Angeles. Major: neurobiology and behavior. Los Angeles, California

Steven M. Grassl, B.S. 1974, Dickinson College; M.S. 1979, Rutgers University. Major: physiology and biophysics. East Lansing, Michigan

William Nathan Green, B.Sc. 1978, University of Toronto. Major: physiology and biophysics. Buffalo, New York

Joanna L. Groden, B.A. 1978, Middlebury College. Major: genetics. Cambridge, Massachusetts

Gregory R. Gummere, B.A. 1979, M.S. 1981, University of Cincinnati. Major: genetics and molecular biology. Cincinnati, Ohio

Ughetta del Balzo Hachfeld, B.A. 1981, Barnard College. Major: physiology and biophysics. Rome, Italy

Robert Hariri, B.A. 1980, Columbia College. Major: pathology. Forest Hills, New York

John M. Harris, B.S. 1980, University of California. Major: pharmacology. La Grange, Illinois

Paul E. Harris, A.B. 1978, University of California. Major: cell biology. Philadelphia, Pennsylvania

*Linda J. Hartley, B.S. 1973, Fordham University. Major: immunology. Schenectady, New York

Howard C. Haspel, B.S. 1978, Polytechnic Institute of New York. Major: biochemistry. Brooklyn, New York

Ruth E. Herz, B.S. 1959, Brooklyn College. Major: biochemistry. New York, New York

Lois M. Hinman, B.S. 1969, Simmons College. Major: biochemistry. New Haven, Connecticut

Marquis Z. Hodes, A.B. 1973, Indiana University at Bloomington; M.S. 1976, Indiana University at Indianapolis. Major: immunology. Indianapolis, Indiana

Miranda J. Hughes, B.S. 1978, State University of New York. Major: pharmacology. Sydney, Australia

Sally T. Ishizaka, B.A. 1976, Wellesley College. Major: immunology. Philadelphia, Pennsylvania

Gajin Jeong, B.S. 1976, M.S. 1978, Seoul National University. Major: immunology. Daejeon, Korea

Ivan Boris John, B.S. 1981, City University of New York. Major: microbiology. Trinidad

Deborah S. Kaseman, B.S. 1978, North Dakota State University. Major: biochemistry. Ashley, North Dakota

Catherine D. Kelly, B.A. 1981, State University of New York at Purchase. Major: microbiology. Rockville Center, New York

Deborah Klein, B.A. 1973, New York University; M.S. 1978, Fordham University. Major: genetics. Teaneck, New Jersey

Renate F. Klein, B.A. 1977, New York University. Major: pathology. Munich, West Germany

Eric Scott Lader, B.S. 1981, Brooklyn College. Major: genetics. Brooklyn, New York

* Leave of absence

William T. L. Lee, B.A. 1978, Johns Hopkins University. Major: genetics. Charlotte, North Carolina

Lynne Lederman, B.S. 1971, State University of New York at Stony Brook; M.S. 1974, Cornell University. Major: immunology. New York, New York

Renee Le Strange, B.A. 1978, University of North Carolina. Major: immunology. Long Branch, New Jersey

Richard B. Levene, B.S. 1972, Tulane University; M.A. 1980, State University of New York. Major: physiology. New York, New York

Sulamita Levine, M.D. 1975, M.S. 1980, University of Zulia Medical School (Venezuela). Major: neurobiology and behavior. Maracaibo, Venezuela

Lucy Tung-Ching Li, B.S. 1973, Cornell University; M.S. 1979, New York University. Major: genetics and molecular biology. New York, New York

Cherie Lindahl, B.S. 1981, Columbia University. Major: pathology. New York, New York

Stanley Lipkowitz, B.A. 1977, Cornell University. Major: biochemistry. Ferndale, New York

Stephen Harold Lockhart, A.B. 1977, Washington University; M. Phil. 1979, Oxford University (England). Major: biostatistics. St. Louis, Missouri

Elaine Louie, B.S. 1974, Brooklyn College. Major: genetics. New York, New York

Thomas C. Lufkin, A.B. 1981, University of California, Berkeley. Major: cell biology. Birmingham, Michigan

Rene Paul Manzo, B.A. 1981, State University of New York at Purchase. Major: cell and developmental biology. New York, New York

Humberto Jose Martinez, M.D. 1975, University of Zulia Medical School (Venezuela). Major: neurobiology and behavior. Maracaibo, Venezuela

John R. Matyas, A.B. 1978, Cornell University. Major: cell and developmental biology. Pittsburgh, Pennsylvania

David H. Maurer, A.B. 1977, Cornell University. Major: immunology. Newburgh, New York

*John P. McGrath, B.S. 1977, University of Scranton. Major: biochemistry. Scranton, Pennsylvania

Richard W. Michitsch, B.A. 1975, M.S. 1978, New York University. Major: genetics and molecular biology. Brooklyn, New York

Carol A. Mirenda, B.A. 1979, Rutgers University. Major: genetics and molecular biology. Englewood, New Jersey

Corinne A. Mitchell, B.S. 1981, Marymount College. Major: genetics. Poughkeepsie, New York

Kate T. Montgomery, B.A. 1978, Vassar College. Major: genetics and molecular biology. Chappaqua, New York

David Brian Musket, B.A. 1980, Boston College. Major: neurobiology and behavior. Providence, Rhode Island

Dennis C. Mynarcik, B.S. 1978, University of Texas at San Antonio. Major: biochemistry. San Antonio, Texas

Dean H. Nakamura, B.S. 1974, M.S. 1977, University of Hawaii. Major: genetics. Honolulu, Hawaii

Barbara T. Nash, B.S. 1972, City University of New York; M.S. 1974, Yale University. Major: biochemistry. Larchmont, New York

Margaret E. Nichols, A.I.M.L.S. 1962, Sir John Cass College (England); F.I.M.L.S. 1964, Mid Essex College (England). Major: genetics. England

Deborah G. Owen, B.S. 1974, University of Louisville. Major: microbiology. Louisville, Kentucky

Roger N. Pearse, B.A. 1977, Dartmouth College. Major: pathology. Newport, Rhode Island

Christine Peterson, B.S. 1976, Herbert H. Lehman College; M.A. 1978, University of California, Santa Barbara. Major: neurobiology and behavior. Bronx, New York

Andrea M. Powell, B.A. 1978, Manhattanville College. Major: pharmacology. New Rochelle, New York

Rebecca Rico-Hesse, B.S. 1978, University of Nebraska; M.P.H. 1980, University of Minnesota. Major: microbiology. Los Angeles, California

Richard J. Riley, B.S. 1972, Manhattan College; M.S. 1976, New York University. Major: biophysics. Yonkers, New York

Donna A. Robertson, B.S. 1979, Syracuse University. Major: pharmacology. White Plains, New York

Joseph A. Rokovich, B.S. 1976, M.S. 1978, California State College. Major: pathology. New Eagle, Pennsylvania

Charles D. Rosenberg, A.B. 1978, Washington University; M.S. 1979, State University of New York at Buffalo. Major: pathology. Merrick, New York

Linda M. Roux, S.B. 1978, Massachusetts Institute of Technology. Major: biochemistry. Los Angeles, California

Stephen D. Rubino, B.S. 1980, Muhlenberg College. Major: microbiology. Harrison, New York

James E. Ruether, B.A. 1981, University of Colorado. Major: genetics and molecular biology. Albany, New York

John R. Sadlik, B.S. 1973, St. John's University. Major: immunology. New York, New York

Kathleen V. Scotto, B.S. 1977, St. John's University. Major: immunology. Queens, New York

Rose Mary Shaffer, B.S. 1980, Loyola College. Major: microbiology. Baltimore, Maryland

Geoffrey I. Shaprio, B.A. 1981, Columbia University. Major: genetics and molecular biology. Schenectady, New York

Hee-Sup Shin, M.M.S. 1977, M.D. 1974, Seoul National University. Major: immunology. Seoul, Korea

Emilia M. Sordillo, A.B. 1976, Harvard University; M.D. 1980, Cornell University. Major: immunology. New York, New York

Mary K. Spiegel, B.S. 1978, Duke University. Major: pharmacology. Knoxville, Tennessee

Jeffrey S. Sprouse, B.A. 1975, University of Delaware; M.S. 1977, Pennsylvania State University. Major: pharmacology. Wilmington, Delaware

Paul Stanley Stinavage, A.A.S. 1977, State University of New York at Morrisville; B.S. 1981, Marywood College. Major: microbiology. Susquehanna, Pennsylvania

Robert J. Storella, B.A. 1978, Wesleyan University. Major: pharmacology. Brighton, Massachusetts

Jeffrey A. Stuckey, B.S. 1977, Butler University. Major: neurobiology and behavior. Lima, Ohio

Alexandra Swiecicki, B.S. 1978, Cornell University. Major: microbiology. Pittsburgh, Pennsylvania

Colleen Taylor, B.S. 1980, Siena College. Major: microbiology. Newark, New Jersey

Jeffrey K. Teumer, B.A. 1979, Colgate University. Major: cell biology. Sheboygan, Wisconsin

G. Peter Todd, B.S. 1977, Utah State University. Major: biochemistry, Washington, D.C.

Mark Underwood, B.A. 1981, University of Vermont. Major: neurobiology and behavior. St. Albans, Vermont

David Wallace, B.S. 1966, City University of New York. Major: microbiology. New York, New York

Steven M. Weisman, B.S., B.A. 1981, Fairleigh Dickinson University. Major: pharmacology. Kansas City, Missouri

Candidates for the Degree of Master of Science

Anwar Noori Mohamed, M.B., Ch.B. 1977, Mosul Medical College. Major: genetics. Mosul, Iraq

*Leslie A. Seiden, B.A. 1978, City University of New York. Major: pathology. New York, New York

Entering Students, 1982

Nagwa A. Abdel-Latif, B.Sc. 1974, M.S. 1979, Ain Shams University. Major: microbiology. Cairo, Egypt

Robert P. Bauchwitz, B.A. 1982, Harvard University. Major: genetics and molecular biology. Wilmington, Delaware

Shi-Zhong Chen. Major: biochemistry. Guangzhou, People's Republic of China

Joseph P. Davide, B.S. 1976, Manhattan College; M.S. 1982, New York Medical College (Valhalla, New York). Major: biochemistry. Port Chester, New York

Andrea L. Dorato, B.Sc. 1982, McGill University. Major: genetics and molecular biology. Montreal, Quebec, Canada

Beatrice S. Eibl, M.S. 1982, University of Vienna. Major: biochemistry. Vienna, Austria

Maria Febbraio, B.S. 1982, Forham University. Major: microbiology. Staten Island, New York

Edmund Giugliano, B.S. 1978, Cornell University; M.S. 1982, C. W. Post College/Long Island University. Major: microbiology. Elmont, New York

Poonam Gulati, B.A. 1982, Cornell University. Major: microbiology. Collins, New York

Onyou Hwang, A.B. 1982, Smith College. Major: biochemistry. Seoul, Korea

Catherine L. Ippolito, B.S. 1982, State University of New York at Stony Brook. Major: biochemistry. East Meadow, New York

Carol E. Jaudon, B.S. 1981, Mississippi University for Women. Major: genetics and molecular biology. Arlington, Texas

Luyuan Li, Graduate Certificate 1982, Sichuan University. Major: biochemistry. Zunyi City, People's Republic of China

Lee-Wen Lin, B.S. 1980; M.S. 1982, National Taiwan University. Major: biochemistry. Taipei, Taiwan, Republic of China

Minsen Mok, B.A. 1982, Johns Hopkins University. Major: cell biology. Convent Station, New Jersey

Haidrun A. Muschick, B.S. 1979, William Smith College. Major: pharmacology. Marion, New York

Fernando de C. Reinach, B.S. 1978, M.S. 1980, University of Sao Paulo, Brazil. Major: cell and developmental biology. Brooklyn, New York

Elizabeth A. Rosenberg, B.A. 1981, Wesleyan University. Major: biochemistry. New York, New York

Heidi M. Rubino, B.S. 1980, Muhlenberg College. Major: biochemistry. New York, New York

Melissa J. Rubock, B.A. 1982, University of Pennsylvania. Major: genetics and molecular biology. Levittown, New York

Kathy L. Signorelli, B.A. 1982, Wellesley College. Major: genetics and molecular biology. Strongsville, Ohio

Purificacion O. Verzosa, B.S.M.T. 1969, Centro Escolar University; M.S. 1977, Fairleigh Dickinson University. Major: microbiology. Monsey, New York

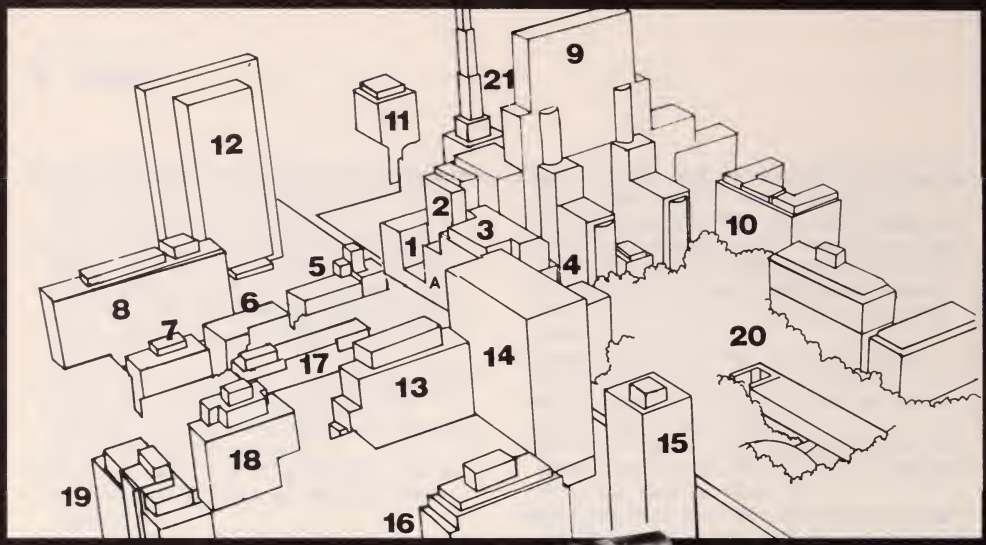
Diane C. Vigar, B.S. 1976, M.S. 1981, Wagner College. Major: microbiology. Staten Island, New York

Lauren C. Weissman, B.S. 1982, State University of New York at Binghamton. Major: biochemistry. Binghamton, New York

Jung-Mou Yang, M.B. 1979, National Defense Medical Center. Major: physiology and biophysics. Taipei, Taiwan, Republic of China

Ning Yen, Diploma 1980, Nanjing University. Major: biochemistry. Nanjing, People's Republic of China

Richard S. Zweis, B.S. 1978, Syracuse University. Major: pharmacology. Elmhurst, New York


1
A
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21


Cornell University Medical College
1. Stavros S. Niarchos Medical Research Building
a. The William Randolph Hearst Microbiology Research Building
2. William Hale Harkness Medical Research Building
3. Samuel J. Wood Library and Research Building
4. Biochemistry Pharmacology Building
5. Olin Hall Admissions Office
6. Livingston Farrand Apartments
7. Kipps Bay Building
8. Lasdon House
The New York Hospital
9. The New York Hospital
10. Payne Whitney Psychiatry Clinic
11. "S" Building
12. Payson House
Memorial Sloan Kettering Cancer Center
13. Elmer and Mamdouha Bobst Medical Sciences Building
14. Memorial Hospital
15. Sloan House
16. Winston House Sloan-Kettering Institute
17. Kettering Laboratory
18. Howard Laboratory
19. Arnold and Marie Schwartz Hall of Science
20. Rockefeller University
21. Hospital for Special Surgery

Index

List of Announcements

The following publications are available from Cornell University:

Agriculture and Life Sciences
College of Architecture, Art, and Planning
College of Arts and Sciences
Graduate School of Business and Public Administration
Engineering at Cornell
Graduate Study in Engineering and Applied Science
General Information*
Graduate School
School of Hotel Administration
College of Human Ecology
School of Industrial and Labor Relations:
ILR Cornell
Graduate Study at ILR
Law School
Medical College (New York City)
Graduate School of Medical Sciences (New York City)
Officer Education (ROTC)
Summer Session
New York State College of Veterinary Medicine

* The *Announcement of General Information* is designed to give prospective students pertinent information about all aspects and academic units of the University

In addition to the *Announcements* listed above, the University publishes a master catalog of University courses, *Description of Courses,* and a handbook for enrolled students, *Academic Information.*

Requests for the publications listed above should be addressed to
Cornell University Announcements
Building 7, Research Park
Ithaca, New York 14850.
(The writer should include a zip code.)